

CLAIMS

What we claim as our invention is:

1. A downhole setting tool, comprising:
a tool housing;
a hollow mandrel situated in the tool housing;
a piston situated between the mandrel and the tool housing;
a collar situated between the mandrel and the tool housing, wherein the tool housing, the mandrel, the piston and the collar define an annulus; and
a first valve that, in a closed position, blocks a path of fluid communication between the interior of the mandrel and the annulus.
2. The downhole setting tool of claim 1, wherein the downhole setting tool is operable to one of set a packer or set a liner hanger.
3. The downhole setting tool of claim 1, wherein the first valve comprises a rupture disk.
4. The downhole setting tool of claim 1, wherein the first valve comprises a valve piston.
5. The downhole setting tool of claim 4, wherein the first valve further comprises a plug configured to mate with the valve piston.
6. The downhole setting tool of claim 1, further comprising a second valve situated in the collar between the annulus and a second annulus partially defined by the collar and the tool housing.
7. The downhole setting tool of claim 6, wherein the second valve comprises a velocity valve that assumes an open position when a pressure in the annulus is approximately equal to a pressure in the second annulus.
8. The downhole setting tool of claim 7, wherein the velocity valve is configured to close when the pressure in the annulus is greater than the pressure in the second annulus by a threshold value.
9. The downhole setting tool of claim 6, wherein the second valve comprises a spring-loaded check valve.

10. The downhole setting tool of claim 9, wherein the spring-loaded check valve is configured to open when a pressure in the second annulus is greater than a pressure in the annulus by a threshold value.

11. The downhole setting tool of claim 9, wherein the mandrel has a transverse hole that runs from an interior of the mandrel to an exterior of the mandrel, further comprising a second spring-loaded check valve situated at the end of the transverse hole, wherein, in a closed position, the second spring-loaded check valve blocks the path of fluid communication between the interior of the mandrel and the annulus via the transverse hole.

12. The downhole setting tool of claim 11, wherein the second spring-loaded check valve is configured to open when a pressure in the annulus is greater than a pressure in the mandrel by a threshold value.

13. A downhole setting tool, comprising;
a tool housing;
a hollow mandrel having at least one transverse hole that runs from an interior of the mandrel to an exterior of the mandrel, the mandrel being situated in the tool housing;
a piston situated between the mandrel and the tool housing;
a collar situated between the mandrel and the tool housing, wherein the tool housing, the mandrel, the piston and the collar define an annulus; and
a vent hole situated in the collar, the vent hole forming a path of fluid communication between the annulus and a second annulus partially defined by the collar and the tool housing.

14. The downhole setting tool of claim 13, further comprising a first valve situated at an end of the at least one transverse hole, wherein in a closed position, the first valve blocks a path of fluid communication between the interior of the mandrel and the annulus via the at least one transverse hole, wherein the first valve comprises a rupture disk.

15. The downhole setting tool of claim 13, further comprising a first valve situated at an end of the at least one transverse hole, wherein in a closed position, the first valve blocks a path of fluid communication between the interior of the mandrel and the annulus via the at least one transverse hole, wherein the first valve comprises a valve piston.

16. A method of setting a liner hanger in a wellbore using a downhole setting tool, the method comprising:

providing a downhole setting tool comprising a tool housing, a mandrel, a piston, and a collar, wherein the tool housing, the mandrel, the piston, and the collar define a first annulus, wherein the tool housing, the mandrel, and the collar partially define a second annulus;

placing the downhole setting tool into the wellbore, the interior of the mandrel and the second annulus being subjected to an ambient wellbore pressure as the downhole setting tool is placed into the wellbore;

adjusting a pressure in the first annulus to approximately the ambient wellbore pressure by bleeding fluid from the second annulus into the first annulus via a first valve situated in the collar, between the first annulus and the second annulus;

pressurizing the interior of the mandrel to a pressure greater than the ambient wellbore pressure;

opening a second valve situated between an interior of the mandrel and the first annulus;

forcing a portion of a fluid situated in the mandrel into the first annulus; and

forcing the piston in a downhole direction with respect to the mandrel.

17. The method of claim 16, wherein adjusting a pressure in the first annulus to approximately the ambient wellbore pressure comprises forcing the first valve from a closed position into an open position.

18. The method of claim 17, further comprising after adjusting a pressure in the first annulus to approximately the ambient wellbore pressure, closing the first valve.

19. The method of claim 16, further comprising after forcing a portion of a fluid situated in the mandrel into the first annulus, bleeding a portion of a fluid situated in the first annulus into the second annulus via the first valve.

20. The method of claim 19, further comprising after bleeding a portion of a fluid situated in the first annulus into the second annulus via the first valve, closing the first valve.

CLAIMS

What we claim as our invention is:

1. A downhole setting tool, comprising;
a tool housing;

a hollow mandrel situated in the tool housing;

a piston situated between the mandrel and the tool housing;

a collar situated between the mandrel and the tool housing, wherein the tool housing, the mandrel, the piston and the collar define an annulus;

a first valve that, in a closed position, blocks a path of fluid communication between the interior of the mandrel and the annulus; and

one or more expansion cones coupled to the piston, wherein the one or more expansion cones are configured to set a liner hanger in a wellbore.
2. The downhole setting tool of claim 1, wherein the one or more expansion cones are configured to longitudinally translate and set the liner hanger in response to the longitudinal translation.
3. The downhole setting tool of claim 1, further comprising a second valve situated in the collar between the annulus and a second annulus partially defined by the collar and the tool housing.
4. The downhole setting tool of claim 3, wherein the second valve comprises a velocity valve that assumes an open position when a pressure in the annulus is approximately equal to a pressure in the second annulus.
5. The downhole setting tool of claim 4, wherein the velocity valve is configured to close when the pressure in the annulus is greater than the pressure in the second annulus by a threshold value.
6. The downhole setting tool of claim 3, wherein the second valve comprises a spring-loaded check valve.

7. The downhole setting tool of claim 6, wherein the spring-loaded check valve is configured to open when a pressure in the second annulus is greater than a pressure in the annulus by a threshold value.
8. The downhole setting tool of claim 1, wherein the hollow mandrel has a transverse hole that runs from an interior of the hollow mandrel to an exterior of the hollow mandrel, further comprising a second valve situated at the end of the transverse hole, wherein, in a closed position, the second valve blocks the path of fluid communication between the interior of the hollow mandrel and the annulus via the transverse hole.
9. The downhole setting tool of claim 8, wherein the second valve is configured to open when a pressure in the annulus is greater than a pressure in the mandrel by a threshold value.
10. A downhole setting tool, comprising:
 - a tool housing;
 - a hollow mandrel having at least one transverse hole that runs from an interior of the mandrel to an exterior of the mandrel, the mandrel being situated in the tool housing;
 - a piston situated between the mandrel and the tool housing;
 - a collar situated between the mandrel and the tool housing, wherein the tool housing, the mandrel, the piston and the collar define an annulus;
 - a vent hole situated in the collar, the vent hole forming a path of fluid communication between the annulus and a second annulus partially defined by the collar and the tool housing; and
 - a setting sleeve coupled to the piston, wherein the setting sleeve is configured to expand at least a portion of a downhole component in a wellbore in response to a pressure in the annulus.
11. The downhole setting tool of claim 10, wherein the downhole component comprises a liner hanger, and wherein the setting sleeve is configured to expand a diameter of the liner hanger.

12. The downhole setting tool of claim 10, wherein the downhole component comprises a packer, and wherein at least a portion of the packer is configured to expand.
13. The downhole setting tool of claim 10, further comprising a first valve situated in the collar between the annulus and a second annulus partially defined by the collar and the tool housing.
14. The downhole setting tool of claim 13, wherein the first valve comprises a velocity valve that assumes an open position when a pressure in the annulus is approximately equal to a pressure in the second annulus.
15. The downhole setting tool of claim 14, wherein the velocity valve is configured to close when the pressure in the annulus is greater than the pressure in the second annulus by a threshold value.
16. The downhole setting tool of claim 13, wherein the first valve comprises a spring-loaded check valve.
17. The downhole setting tool of claim 16, wherein the spring-loaded check valve is configured to open when a pressure in the second annulus is greater than a pressure in the annulus by a threshold value.
18. The downhole setting tool of claim 13, wherein the mandrel has a transverse hole that runs from an interior of the mandrel to an exterior of the mandrel, further comprising a second valve situated in the transverse hole, wherein, in a closed position, the second valve blocks the path of fluid communication between the interior of the mandrel and the annulus via the transverse hole.
19. The downhole setting tool of claim 18, wherein the second valve is configured to open when a pressure in the annulus is greater than a pressure in the mandrel by a threshold value.
20. The downhole setting tool of claim 18, wherein the second valve comprises at least one of a rupture disk or a spring-loaded check valve.