CLAIMS

What is claimed is:

1. A screen assembly capable of being disposed in a wellbore, comprising:

a base pipe comprising a sidewall portion defining at least one opening therein;

a rigid member disposed about a first portion of the base pipe and having a piston arranged therein, the piston having a telescoping portion movably arranged within a non-telescoping portion;

an autonomous valve arranged within the piston and providing fluid communication between a filter medium and the at least one opening in the base pipe, the filter medium being disposed at least partially about the base pipe and coupled to the telescoping portion of the piston; and

a swellable material disposed about a second portion of the base pipe, the filter medium being at least partially disposed about the swellable material and configured to filter and direct the fluids to the piston, wherein, as the swellable material expands, at least part of the filter medium is displaced toward an inner surface of the wellbore, thereby extending the telescoping portion.

2. The screen assembly of claim 1, wherein the autonomous valve comprises:

at least one inlet in fluid communication with the filter medium;

a flow chamber in fluid communication with the at least one inlet and through which a fluid composition is able to flow;

at least one outlet in fluid communication with the flow chamber; and

at least one structure spirally oriented relative to the at least one outlet, whereby the at least one structure induces spiral flow of the fluid composition about the at least one outlet.

3. The screen assembly of claim 2, wherein the at least one structure impedes a change in direction of flow of the fluid composition radially toward the at least one outlet.

4. The screen assembly of claim 3, wherein the at least one structure increasingly impedes the change in direction radially toward the at least one outlet in response to at least one of a) increased velocity of the fluid

composition, b) decreased viscosity of the fluid composition, and c) a reduced ratio of desired fluid to undesired fluid in the fluid composition.

5. The screen assembly of claim 2, wherein the at least one structure comprises at least one of a vane and a recess.

6. The screen assembly of claim 2, wherein the at least one structure comprises multiple spaced apart structures.

7. The screen assembly of claim 2, wherein spacing between adjacent structures decreases in a direction of spiral flow of the fluid composition.

8. The screen assembly of claim 2, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a viscosity of the fluid composition increases.

9. The screen assembly of claim 2, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a velocity of the fluid composition decreases.

10. The screen assembly of claim 2, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a ratio of desired fluid to undesired fluid in the fluid composition increases.

11. The screen assembly of claim 1, wherein the autonomous valve is coupled to the non-telescoping portion of the piston.

12. The screen assembly of claim 1, wherein the autonomous valve is coupled to the telescoping portion of the piston, and therefore moves with the telescoping portion.

13. A method of producing a fluid composition from a subterranean formation, comprising:

introducing a screen assembly into the subterranean formation, the screen assembly comprising a base pipe defining at least one opening therein, a rigid member disposed about a first portion of the base pipe, a swellable material disposed about a second portion of the base pipe, and a filter medium at least partially disposed about the swellable material and coupled thereto;

expanding the swellable material toward an inner surface of a wellbore and thereby actuating a piston arranged within the rigid member, the piston having a telescoping portion coupled to the filter material and movably arranged within a non-telescoping portion of the piston;

filtering the fluid composition through the filter material and directing a filtered fluid to the piston; and

regulating a flow of the filtered fluid composition through the piston with an autonomous valve arranged within the piston, the autonomous valve providing fluid communication between the filter medium and the at least one opening in the base pipe.

14. The method of claim 13, wherein the autonomous valve includes at least one inlet in fluid communication with the filter medium, a flow chamber in fluid communication with the at least one outlet, and at least one outlet in fluid communication with the flow chamber,

the method further comprising inducing spiral flow of the fluid composition about the at least one outlet using at least one structure arranged within the flow chamber and spirally oriented relative to the at least one outlet.

15. The method of claim 14, further comprising impeding a change in direction of flow of the fluid composition radially toward the at least one outlet using the at least one structure.

16. The method of claim 14, further comprising flowing the fluid composition more directly from the at least one inlet to the at least one outlet as a viscosity of the fluid composition increases.

17. The method of claim 14, further comprising flowing the fluid composition more directly from the at least one inlet to the at least one outlet as a velocity of the fluid composition decreases.

18. The method of claim 14, further comprising flowing the fluid composition more directly from the at least one inlet to the at least one outlet as a ratio of desired fluid to undesired fluid in the fluid composition increases.

19. A screen assembly capable of being disposed in a wellbore, comprising:

a base pipe comprising a sidewall portion having a first portion that defines a first opening and a second portion that defines a second opening;

a first rigid member disposed about the first portion of the base pipe and having a first piston arranged therein, the first piston having a first telescoping portion movably arranged within a first non-telescoping portion;

a second rigid member disposed about the second portion of the base pipe and having a second piston arranged therein, the second piston having a second telescoping portion arranged within a second non-telescoping portion;

a first autonomous valve arranged within the first piston and providing fluid communication between a filter medium and the first opening in the first base pipe, the filter medium being disposed at least partially about the base pipe and coupled to the first telescoping portion of the first piston near a first end of the filter medium;

a second autonomous valve arranged within the second piston and providing fluid communication between the filter medium and the second opening in the second base pipe, the filter medium also being coupled to the second telescoping portion of the second piston near a second end of the filter medium; and

a swellable material disposed about a third portion of the base pipe located between the first portion and the second portion, the filter medium being at least partially disposed about the swellable material and capable of filtering fluids and directing the fluids to the first piston and the second piston, wherein, as the swellable material expands, at least a portion of the filter medium is displaced toward a surface of the wellbore, thereby extending the first and second telescoping portions.

20. The screen assembly of claim 19, wherein each of the first and second autonomous valves comprises:

at least one inlet in fluid communication with the filter medium;

a flow chamber in fluid communication with the at least one inlet and through which a fluid composition is able to flow;

at least one outlet in fluid communication with the flow chamber; and

at least one structure spirally oriented relative to the at least one outlet, whereby the at least one structure induces spiral flow of the fluid composition about the at least one outlet.

21. The screen assembly of claim 20, wherein the at least one structure impedes a change in direction of flow of the fluid composition radially toward the at least one outlet.

22. The screen assembly of claim 21, wherein the at least one structure increasingly impedes the change in direction radially toward the at least one outlet in response to at least one of a) increased velocity of the fluid composition, b) decreased viscosity of the fluid composition, and c) a reduced ratio of desired fluid to undesired fluid in the fluid composition.

23. The screen assembly of claim 20, wherein the at least one structure comprises at least one of a vane and a recess.

24. The screen assembly of claim 20, wherein the at least one structure comprises multiple spaced apart structures.

25. The screen assembly of claim 20, wherein spacing between adjacent structures decreases in a direction of spiral flow of the fluid composition.

26. The screen assembly of claim 20, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a viscosity of the fluid composition increases.

27. The screen assembly of claim 20, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a velocity of the fluid composition decreases.

28. The screen assembly of claim 20, wherein the fluid composition flows more directly from the at least one inlet to the at least one outlet as a ratio of desired fluid to undesired fluid in the fluid composition increases.

29. The screen assembly of claim 19, wherein one or both of the first and second autonomous valves is coupled to the corresponding first and second non-telescoping portion of the first and second pistons, respectively.

30. The screen assembly of claim 19, wherein one or both of the first and second autonomous valves is coupled to the corresponding first and second telescoping portions of the first and second pistons, respectively, and therefore moves with the first or second telescoping portions.

CLAIMS

The invention claimed is:

1. A screen assembly capable of being disposed in a wellbore, comprising:

a base pipe comprising a sidewall portion defining at least one opening therein;

a rigid member disposed about a first portion of the base pipe and having a piston arranged therein, the piston having a telescoping portion movably arranged within a non-telescoping portion;

an autonomous valve vertically arranged within the piston and providing fluid communication between a filter medium and the at least one opening in the base pipe, the filter medium being disposed at least partially about the base pipe and coupled to the telescoping portion of the piston, wherein the autonomous valve comprises:

a top defining at least two apertures that provide fluid communication from the filter medium into corresponding inlets of the autonomous valve;

a flow chamber in fluid communication with the corresponding inlets and through which a fluid composition is able to flow;

a bottom defining at least one outlet in fluid communication with the flow chamber; and

at least one structure spirally oriented relative to the at least one outlet and configured to induce spiral flow of the fluid composition about the at least one outlet; and

a swellable material disposed about a second portion of the base pipe, the filter medium being at least partially disposed about the swellable material and configured to filter and direct the fluids to the piston, wherein, as the swellable material expands, at least part of the filter medium is displaced toward an inner surface of the wellbore, thereby extending the telescoping portion.

2. The screen assembly of claim 1, wherein the top engages the at least one structure so as to form the flow chamber and wherein the at least one structure impedes a change in direction of flow of the fluid composition radially toward the at least one outlet.

3. The screen assembly of claim 2, wherein the at least one structure increasingly impedes the change in direction radially toward the at least one outlet in response to at least one of a) increased velocity of the fluid composition, b) decreased viscosity of the fluid composition, and c) a reduced ratio of desired fluid to undesired fluid in the fluid composition.

4. The screen assembly of claim 1, wherein the at least one structure comprises at least one of a vane and a recess.

5. The screen assembly of claim 1, wherein the at least one structure comprises multiple spaced apart structures.

6. The screen assembly of claim 5, wherein spacing between adjacent multiple spaced apart structures decreases in a direction of spiral flow of the fluid composition.

7. The screen assembly of claim 1, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a viscosity of the fluid composition increases.

8. The screen assembly of claim 1, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a velocity of the fluid composition decreases.

9. The screen assembly of claim 1, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a ratio of desired fluid to undesired fluid in the fluid composition increases.

10. The screen assembly of claim 1, wherein the autonomous valve is coupled to the non-telescoping portion of the piston.

11. The screen assembly of claim 1, wherein the autonomous valve is coupled to the telescoping portion of the piston, and therefore moves with the telescoping portion.

12. A method of producing a fluid composition from a subterranean formation, comprising:

introducing a screen assembly into the subterranean formation, the screen assembly comprising a base pipe defining at least one

opening therein, a rigid member disposed about a first portion of the base pipe, a swellable material disposed about a second portion of the base pipe, and a filter medium at least partially disposed about the swellable material and coupled thereto;

expanding the swellable material toward an inner surface of a wellbore and thereby actuating a piston arranged within the rigid member, the piston having a telescoping portion coupled to the filter material and movably arranged within a non-telescoping portion of the piston;

filtering the fluid composition through the filter material and directing a filtered fluid to the piston;

receiving the filtered fluid with an autonomous valve vertically arranged within the piston, the autonomous valve comprising:

a top defining at least two apertures that provide fluid communication from the filter medium into corresponding inlets of the autonomous valve;

a flow chamber in fluid communication with the corresponding inlets and through which a fluid composition is able to flow;

a bottom defining at least one outlet in fluid communication with the flow chamber; and

at least one structure spirally oriented relative to the at least one outlet; and

inducing spiral flow of the fluid composition about the at least one outlet using the at least one structure and thereby regulating a flow of the filtered fluid through the piston.

13. The method of claim 12, further comprising impeding a change in direction of flow of the filtered fluid radially toward the at least one outlet using the at least one structure.

14. The method of claim 12, further comprising flowing the filtered fluid more directly from the corresponding inlets to the at least one outlet as a viscosity of the filtered fluid increases.

15. The method of claim 12, further comprising flowing the filtered fluid more directly from the corresponding inlets to the at least one outlet as a velocity of the filtered fluid decreases.

16. The method of claim 12, further comprising flowing the filtered fluid more directly from the corresponding inlets to the at least one outlet as a ratio of desired fluid to undesired fluid in the filtered fluid increases.

17. A screen assembly capable of being disposed in a wellbore, comprising:

a base pipe comprising a sidewall portion having a first portion that defines a first opening and a second portion that defines a second opening;

a first rigid member disposed about the first portion of the base pipe and having a first piston arranged therein, the first piston having a first telescoping portion movably arranged within a first non-telescoping portion;

a second rigid member disposed about the second portion of the base pipe and having a second piston arranged therein, the second piston having a second telescoping portion arranged within a second non-telescoping portion;

a first autonomous valve vertically arranged within the first piston and providing fluid communication between a filter medium and the first opening in the base pipe, the filter medium being disposed at least partially about the base pipe and coupled to the first telescoping portion of the first piston near a first end of the filter medium;

a second autonomous valve vertically arranged within the second piston and providing fluid communication between the filter medium and the second opening in the base pipe, the filter medium also being coupled to the second telescoping portion of the second piston near a second end of the filter medium, wherein each of the first and second autonomous valves comprise:

a top defining at least two apertures that provide fluid communication from the filter medium into

corresponding inlets of the corresponding autonomous valve;

a flow chamber in fluid communication with the corresponding inlets and through which a fluid composition is able to flow;

a bottom defining at least one outlet in fluid communication with the flow chamber; and

at least one structure spirally oriented relative to the at least one outlet and configured to induce spiral flow of the fluid composition about the at least one outlet; and

a swellable material disposed about a third portion of the base pipe located between the first portion and the second portion, the filter medium being at least partially disposed about the swellable material and capable of filtering fluids and directing the fluids to the first piston and the second piston, wherein, as the swellable material expands, at least a portion of the filter medium is displaced toward a surface of the wellbore, thereby extending the first and second telescoping portions.

18. The screen assembly of claim 17, wherein the top of each of the first and second autonomous valves engages the at least one structure so as to form the flow chamber and wherein the at least one structure impedes a change in direction of flow of the fluid composition radially toward the at least one outlet.

19. The screen assembly of claim 18, wherein the at least one structure increasingly impedes the change in direction radially toward the at least one outlet in response to at least one of a) increased velocity of the fluid composition, b) decreased viscosity of the fluid composition, and c) a reduced ratio of desired fluid to undesired fluid in the fluid composition.

20. The screen assembly of claim 17, wherein the at least one structure comprises at least one of a vane and a recess.

21. The screen assembly of claim 17, wherein the at least one structure comprises multiple spaced apart structures.

22. The screen assembly of claim 21, wherein spacing between adjacent multiple spaced apart structures decreases in a direction of spiral flow of the fluid composition.

23. The screen assembly of claim 17, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a viscosity of the fluid composition increases.

24. The screen assembly of claim 17, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a velocity of the fluid composition decreases.

25. The screen assembly of claim 17, wherein the fluid composition flows more directly from the corresponding inlets to the at least one outlet as a ratio of desired fluid to undesired fluid in the fluid composition increases.

26. The screen assembly of claim 17, wherein one or both of the first and second autonomous valves is coupled to the corresponding first and second non-telescoping portion of the first and second pistons, respectively.

27. The screen assembly of claim 17, wherein one or both of the first and second autonomous valves is coupled to the corresponding first and second telescoping portions of the first and second pistons, respectively, and therefore moves with the first or second telescoping portions.

28. The screen assembly of claim 11, wherein the telescoping portion includes a lip configured to seat the autonomous valve.

29. The screen assembly of claim 27, wherein one or both of the first and second telescoping portions includes a lip configured to seat the corresponding autonomous valve.