CLAIMS

What is claimed is:

1. A filter assembly for filtering liquid, comprising:

a filter housing including a cap, a bowl, and an enclosed space, a lower circumferential surface of the cap affixed to an upper circumferential surface of the bowl to form the enclosed space, the cap including a fluid inlet port, a fluid outlet port, and a gas venting port for the enclosed space, and the bowl including slots disposed on an inner side of the bowl; and

a filter cartridge disposed in the enclosed space of the filter housing and fluidly connected to the fluid inlet port and the fluid outlet port in the cap, and the filter cartridge including radial projections disposed in the slots of the bowl blocking rotation of the filter cartridge relative to the bowl and preventing a bottom and a side of the filter cartridge from contacting the bowl.

2. The filter assembly of claim 1, wherein all contact between the cap and the bowl and between the cap and the filter cartridge is via corresponding mating surfaces of the cap, the bowl, and the filter cartridge.

3. The filter assembly of claim 1, wherein

a bottom of the cap is pressed against a top of the filter cartridge preventing vertical movement of the filter cartridge in the enclosed space, and

each of the radial projections is inserted into a respective one of the slots, each of the radial projections and the respective one of the slots have a same width that prevents circumferential movement of each of the radial projections within each of the slots.

4. The filter assembly of claim 4, wherein all contact between the filter cartridge and the bowl is via the radial projections and the slots.

5. The filter assembly of claim 1, wherein

the cap includes a first connection ridge that extends from a bottom of the cap and surrounds each of the fluid inlet port and the fluid outlet port in the cap, and

the filter cartridge includes a top with a cartridge inlet, a cartridge outlet, and a second connection ridge that extends from the top of the filter cartridge and surrounds each of the cartridge inlet and the cartridge outlet in the filter cartridge, and the first connection ridge of the cap being affixed to the second connection ridge of the filter cartridge.

6. The filter assembly of claim 5, wherein all contact between the filter cartridge and the cap is via the first connection ridge and the second connection ridge.

7. The filter assembly of claim 5, wherein the first connection ridge is affixed to the second connection ridge to form each of:

an intermediate inlet passageway that is a sealed fluid connection from the fluid inlet port of the cap to the cartridge inlet of the filter cartridge, and

an intermediate outlet passageway that is a sealed fluid connection from the cartridge outlet of the filter cartridge to the fluid outlet port of the cap.

8. The filter assembly of claim 5, wherein the second connection ridge includes:

a first ridge portion that surrounds the cartridge inlet, and

a second ridge that extends from the first ridge portion and surrounds the cartridge outlet.

9. The filter assembly of claim 8, wherein the second connection ridge includes a third ridge portion and a fourth ridge portion, and each of the second ridge portion, the third ridge portion, and the fourth ridge portion extends outward from the first portion in a different radial direction.

10. The filter assembly of claim 5, wherein the filter cartridge has a cylindrical shape, the cartridge inlet and the fluid inlet port disposed along a vertical axis of the cylindrical shape of the filter cartridge.

11. The filter cartridge of claim 5, wherein the first connection ridge and the second connection ridge have a same shape.

12. The filter cartridge of claim 5, wherein the lower circumferential surface is spaced apart from the first connection ridge of the cap.

13. The filter cartridge of claim 5, wherein the side of the filter cartridge is radially spaced apart from the inner side of the bowl by the radial projections to form one or more vent passageways configured to direct gas within the enclosed space to the gas venting port in the cap.

14. The filter cartridge of claim 13, wherein the one or more vent passageways is a plurality of the vent passageways, each of the vent passageways extending between a respective pair of the radial projections.

15. The filter cartridge of claim 1, wherein the filter cartridge includes at least three of the radial projections, and the bowl including at least three of the slots.

16. A method of making a filter assembly for filtering liquid, comprising:

inserting a filter cartridge into a bowl, the filter cartridge including radial projections and the bowl including slots disposed on an inner side of the bowl, wherein the inserting of the filter cartridge into the bowl includes:

inserting each of the radial projections into a respective one of the slots of the bowl, the radial projections inserted in the slots preventing rotation of the filter cartridge relative to the bowl and preventing a bottom and a side of the filter cartridge from contacting the bowl; and

affixing a cap to the bowl to form an enclosed space containing the filter cartridge, the cap including a fluid inlet port, a fluid outlet port, and a gas venting port, wherein the affixing of the cap to the bowl includes:

affixing a lower circumferential surface of the cap to an upper circumferential surface of the bowl.

17. The method of claim 16, wherein the inserting of the radial projections into the slots of the bowl results in the filter cartridge hanging within the bowl by the radial projections.

18. The method of claim 16, wherein the lower circumferential surface of the cap and the upper circumferential surface of the bowl are affixed by being thermally fused together.