

WHAT IS CLAIMED IS:

1. A filter unit for a mixing apparatus comprising:
a hydrophilic filter configured to receive a fluid including a liquid and gas, the hydrophilic filter further configured to sterilize the liquid; and
a hydrophobic vent filter configured to receive the gas from the hydrophilic filter, the hydrophobic vent filter further comprising a vent and a membrane configured to separate an interior of the filter unit from an exterior of the filter unit, the gas being vented from the filter unit by flowing across the membrane and out of the vent.
2. The filter unit of claim 1, wherein the hydrophobic vent filter is configured to receive some of the liquid from the hydrophilic filter.
3. The filter unit of claim 1, wherein the hydrophobic vent filter is at least partially composed of at least one of polytetrafluoroethylene or polyvinylidene fluoride.
4. The filter unit of claim 1, wherein the hydrophilic filter is at least partially composed of a polyethersulfone.
5. The filter unit of claim 1, wherein the hydrophobic vent filter further comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising the vent and the filter element comprising the membrane; and
wherein the filter element is coupled to the filter capsule such that gas is vented from the filter unit by flowing across the membrane into a hollow center of the filter element and out of the vent.
6. The filter unit of claim 1, wherein the hydrophilic filter comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising an outlet port and the filter element comprising a second membrane configured to sterilize the liquid; and

wherein the filter element is coupled to the filter capsule such that the liquid is evacuated from the filter unit by flowing across the second membrane into a hollow center of the filter element and out of the outlet port.

7. A filter unit for a mixing apparatus comprising:

a hydrophilic filter configured to receive a fluid including a liquid, gas, and foam comprised of the liquid containing trapped gas, the hydrophilic filter further configured to sterilize the liquid;

a defoaming device configured to receive the gas, the foam, and some of the liquid from the hydrophilic filter, the defoaming device further configured to release at least some of the gas from the foam; and

a hydrophobic vent filter configured to receive the gas from the defoaming device, the hydrophobic vent filter further comprising a vent and a membrane configured to separate an interior of the filter unit from an exterior of the filter unit, the gas being vented from the filter unit by flowing across the membrane and out of the vent.

8. The filter unit of claim 7, wherein the hydrophobic vent filter is configured to receive some of the liquid from the defoaming device.

9. The filter unit of claim 7, wherein the defoaming device contains a defoaming substance configured to release the at least some of the gas from the foam.

10. The filter unit of claim 9, wherein the defoaming substance comprises stainless steel shavings.

11. The filter unit of claim 7, wherein the hydrophobic vent filter is at least partially composed of at least one of polytetrafluoroethylene or polyvinylidene fluoride.

12. The filter unit of claim 7, wherein the hydrophilic filter is at least partially composed of a polyethersulfone.

13. The filter unit of claim 7, wherein the hydrophobic vent filter further comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising the vent and the filter element comprising the membrane; and

wherein the filter element is coupled to the filter capsule such that gas is vented from the filter unit by flowing across the membrane into a hollow center of the filter element and out of the vent.

14. The filter unit of claim 7, wherein the hydrophilic filter comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising an outlet port and the filter element comprising a second membrane configured to sterilize the liquid; and

wherein the filter element is coupled to the filter capsule such that the liquid is evacuated from the filter unit by flowing across the second membrane into a hollow center of the filter element and out of the outlet port.

15. A method of filtering a solution comprising:

receiving, at a filter unit comprised of a hydrophilic filter, a defoaming device, and a hydrophobic vent filter, a fluid including a liquid, gas, and foam comprised of the liquid containing trapped gas;

directing the gas and foam to the defoaming device, wherein the defoaming device is configured to release at least some of the gas from the foam;

venting the gas across a membrane and out of a vent of the hydrophobic vent filter, the membrane configured to separate an interior of the filter unit from an exterior of the filter unit;

sterilizing the liquid by the hydrophilic filter; and

evacuating the sterilized liquid from the filter unit.

16. The method of claim 15, wherein the hydrophobic vent filter is configured to receive some of the liquid.

17. The method of claim 15, wherein the defoaming device contains a defoaming substance configured to release the at least some of the gas from the foam.

18. The method of claim 15, wherein the hydrophobic vent filter is at least partially composed of at least one of polytetrafluorethylene or polyvinylidene fluoride.
19. The method of claim 15, wherein the hydrophobic vent filter further comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising the vent and the filter element comprising the membrane; and
wherein venting the gas comprises venting the gas across the membrane into a hollow center of the filter element and out of the vent.
20. The method of claim 15, wherein the hydrophilic filter comprises a hollow cylindrical filter element disposed within a cylindrical filter capsule, the filter capsule comprising an outlet port and the filter element comprising a second membrane configured to sterilize the liquid;
wherein sterilizing the liquid comprises flowing the liquid across the membrane into a hollow center of the filter element; and
wherein evacuating the sterilized liquid comprises evacuating the liquid out of the outlet port.