

CLAIMS

1. A dialysate regenerator (100) for connecting to a dialysis apparatus, the dialysate regenerator (100) comprising
 - a regenerator inlet (102) for receiving dialysate;
 - a regenerator outlet (104) for dispensing regenerated dialysate;
 - a hydraulic circuit (110) connected between the regenerator inlet (102) and the regenerator outlet (104), and further comprising a fluid portioning system (120) to divide a dialysate flow into uniform portions for sequential regeneration.
2. The dialysate regenerator (100) of claim 1, wherein the sequential regeneration comprises two alternate states (ST1, ST2) comprising a first state (ST1) and a second state (ST2), and the fluid portioning system (120) comprises:
 - a chamber (121) comprising
 - a movable separator wall (122) separating the interior of the chamber (121) into a first compartment (124) and a second compartment (126),
 - a first opening (128) for allowing exchange of dialysate to and from the first compartment (124);
 - a second opening (129) for allowing exchange of dialysate to and from the second compartment (126); and
 - wherein the fluid portioning system (120) is configured to allow dialysate flow from the regenerator inlet (102) to one of the first and second compartments (124, 126) in the first state (ST1) and to the other one of the first and second compartments (126, 124) in the second state (ST2), wherein dialysate ingress into the one compartment (124, 126) causes displacement of the movable separator wall (122) and dialysate egress from the other compartment (126, 124).
3. The dialysate regenerator (100) of claim 2, wherein the hydraulic circuit (110) further comprises a flow adjuster (130) configured to detect an external flow or an external pressure from one or both of the regenerator inlet (102) and the regenerator outlet (104) and to adjust an internal flow or an internal pressure so that the external flow remains unchanged.

4. The dialysate regenerator (100) of claim 3, wherein the flow adjuster (130) comprises a dampener (134, 135) for accommodating temporary changes of internal pressure.
5. The dialysate regenerator (100) of claim 3 or claim 4, wherein the flow adjuster (130) comprises a pressure sensor (136) to detect the external pressure at the one or both of the regenerator inlet (102) and the regenerator outlet (104) and wherein the flow adjuster (130) is configured to adjust the internal flow or internal pressure based on the external pressure detected by the sensor (136).
6. The dialysate regenerator (100) of any one of claims 3 to 5, further comprising a housing (200),
 - wherein the housing (200) comprises a base (220) and a counter portion (210) which are releasably attachable to each other,
 - wherein the chamber (121) comprises a base part (222) and a counter part (212) base part, the base part comprised by the base (220) of the housing (200),
 - wherein the counter part (212) and the base part (222) of the chamber (121) are attached together when the counter portion (210) and the base (220) are attached to each other.
7. The dialysate regenerator (100) of claim 6, wherein the counter part (212) of the chamber (121) is comprised by a replaceable cartridge and the base (220) is reusable.
8. The dialysate regenerator (100) of claim 6 or claim 7, wherein the movable separator wall (122) or a layer thereof in case of a multilayer separator wall, is attached to the counter part (212) of the chamber (121).
9. The dialysate regenerator (100) of any one of the claims 2 to 8, wherein the separator wall (122) is a membrane.

10. The dialysate regenerator (100) of claim 9, wherein the membrane is pre-shaped and is flipable between a first membrane side being convex in the first state (ST1) and a second side being convex in the second state (ST2).

11. The dialysate regenerator (100) of claim 9, wherein

the first compartment comprises a first bag fluidly connected to the first opening (128) and wherein the separator wall (122) is a wall of the first bag, or

the second compartment comprises a second bag fluidly connected to the second opening (129) and wherein the separator wall (122) is a wall of the second bag,

or a combination of the above, in which the wall of the first bag and the wall of the second bag contact each other and form the separator wall (122).

12. The dialysate regenerator (100) of any one of claims 3 to 5, wherein the flow adjuster (130) comprises a pump (132) to increase pressure or to increase internal flow.

13. The dialysate regenerator (100) of claim 12, wherein the pump (132) comprises two pump chambers (C1, C2) that are configured to alternately allow inflow of dialysate and to pump the dialysate out through an opening of a corresponding pump chamber.

14. The dialysate regenerator (100) of claim 12 or claim 13, wherein the pump (132) is pneumatic and to pump the dialysate comprises applying pneumatic pressure on a side of a moveable pump wall that is opposite to a dialysate contacting side, on the corresponding pump chamber (C1, C2).

15. The dialysate regenerator (100) of any one of claims 12 to 14, further comprising a housing (200), wherein the pump (132) is connected to the housing (200), and wherein the housing (200) comprises a counter portion (210) and a base (220) which are releasably attachable to each other.

16. The dialysate regenerator (100) of claim 15, wherein one of the two pump chambers (C2) is divided into two chambers connected in parallel (131) to a pneumatic pressure receiving side and wherein the two chambers are disposed on opposite sides of the other one of the two

pump chambers (C1), so that tension applied to the housing (200) during pumping by one of the two pump chambers (C1, C2) is symmetrically distributed to the other one of the two pump chambers (C2, C1).

17. The dialysate regenerator (100) of claim 16, wherein the pneumatic pressure receiving side of the one of the two pump chambers and a further pneumatic pressure receiving side of the other one of the two pump chambers are disposed on the base (220).

18. The dialysate regenerator (100) of any one of claims 6 to 16, wherein the base (220) is reusable and comprises control elements and the counter portion (210) comprises disposable elements.

19. The dialysate regenerator (100) of claim 6 or claim 15, wherein the base (220) is reusable, the counter portion (210) of the housing (200) comprises a replaceable cartridge.

20. The dialysate regenerator (100) of any of the previous claims further comprising a purification means.

21. The dialysate regenerator (100) of claim 20, further comprising a regeneration compartment comprising the purification means.

22. The dialysate regenerator (100) of claims 20 or 21, wherein the purification means comprises one or both of is an adsorption filter or a sorbent cartridge.

23. The dialysate regenerator (100) of any one of claims 20 to 22, wherein the hydraulic circuit (110) further comprises an infusate input and is configured to add a predetermined volume of infusate to the dialysate.

24. The dialysate regenerator (100) of any of the previous claims, further comprising an additive doser (400) configured to mix an additive into the dialysate, the additive doser (400) comprising an additive portioning system synchronized with the fluid portioning system that portions the dialysate.

25. The dialysate regenerator (100) of claims 20 or 21, wherein the hydraulic circuit (110) further comprises:

- the purification means; and
- at least one reversible retainer comprising an ion dampener,

wherein a direction of the dialysate flow through the reversible retainer is reversible.

26. A dialysis system (300) comprising

a dialysis apparatus (310) comprising:

- a fresh dialysate input (314);
- a spent dialysate output (312); and

the dialysate regenerator (100) of any of the claims 1 to 25,
wherein the regenerator inlet (102) is coupled to the spent dialysate output (312) for receiving spent dialysate, and wherein the regenerator outlet (104) is coupled to the fresh dialysate input (314) for dispensing regenerated dialysate.