CLAIMS

WHAT IS CLAIMED IS:

1. A hemofilter for use in filtering blood in vivo, the hemofilter comprising:

an extended inlet manifold;

a plurality of filtration channels; and

an extended outlet manifold,

the extended inlet manifold comprising:

a first region comprising:

a circular inlet configured for connection to a blood vessel of an individual; and a transition section in which lumen of the extended inlet manifold transitions from having a circular cross-section to having a rectangular cross-section; and

a second region comprising a U-shaped turn and followed by a linear tapered section, the linear tapered section comprising a plurality of openings in fluid communication with the plurality of filtration channels,

wherein the plurality of filtration channels are arranged in a spaced-apart stacked configuration and are in fluid communication with a plurality of openings in a first region of the outlet manifold,

wherein the first region of the outlet manifold is parallel to the linear tapered section of the extended inlet manifold and is reverse-tapered with reference to the linear tapered section of the extended inlet manifold and wherein the outlet manifold comprises a second region comprising:

a transition section in which lumen of the outlet manifold transitions from having a rectangular cross-section to having a circular cross-section; and

a circular outlet defined by the circular cross-section of the outlet manifold, and

wherein the hemofilter is configured for entry of blood through the inlet and for transporting the blood through the transition section of the extended inlet manifold to the tapered linear section, into the plurality of filtration channels to the first region of the outlet manifold, into the transition section of the outlet manifold, and exit via the circular outlet.

2. The hemofilter of claim 1, wherein channels of the plurality of filtration channels are rectangular and are stacked in a parallel configuration.

3. The hemofilter of claim 1 or 2, wherein the transition section in extended inlet manifold includes a turn which changes direction of blood flow with reference to the direction in the inlet by 60º -120º.

4. The hemofilter of any one of claims 1-3, wherein the U-shaped turn in the second region of the extended inlet manifold changes the direction of blood flow with reference to the direction in the transition section by 150º and 210º.

5. The hemofilter of any one of claims 1-4, wherein the tapered section of the extended inlet manifold decreases in height.

6. The hemofilter of any one of claims 1-5, wherein the tapered section of the extended inlet manifold decreases in width.

7. The hemofilter of any one of claims 1-6, wherein the plurality of filtration channels comprises 2-50 channels.

8. The hemofilter of any one of claims 1-7, wherein the plurality of filtration channels comprises a first curved region connected to the tapered section of the extended inlet manifold, a linear section, and a second curved region connected to the reverse-tapered section of the outlet manifold, wherein the curvature of the first curved region is opposite to the curvature of the second curved region.

9. The hemofilter of any one of claims 1-8, wherein the plurality of channels each define a rectangular channel lumen enclosed by a top surface, a bottom surface, and side walls connecting the top and bottom surfaces.

10. The hemofilter of claim 9, wherein the top surface comprises a membrane for filtration of blood in the channel lumen.

11. The hemofilter of claim 9 or 10, wherein the bottom surface comprises a membrane for filtration of blood in the channel lumen.

12. The hemofilter of any one of claims 1-11, wherein the tapered section of the extended inlet manifold and the reverse-tapered section of the outlet manifold and a top channel of the plurality of channels and a bottom channel of the plurality of channels are arranged in shape of a parallelogram.

13. The hemofilter of any one of claims 1-12, wherein the plurality of channels are shaped and dimensioned to provide a volumetric flow rate of 20-100 ml/min for blood flowing through each of the channels and wherein the hemofilter provides a volumetric flow rate of 750-2000 ml/min for blood flowing through the hemofilter.

14. The hemofilter of any one of claims 1-13, wherein each of the plurality of channels has a length of 10 mm - 200 mm.

15. The hemofilter of any one of claims 1-13, wherein each of the plurality of channels has a width of 5 mm - 100 mm.

16. The hemofilter of any one of claims 1-13, wherein each of the plurality of channels has a height of 0.5 mm – 2.5 mm.