CLAIMS:

1. A device comprising,

two sheets of a substrate material, at least one of the sheets of substrate material having one or more depressions extending to an edge of the at least one of the sheets of substrate material, the two sheets of substrate material bonded together along their outer edges except where the one or more depressions extend to the outer edges,

whereby the one or more depressions form one or more internal channels between the two sheets of substrate material, the one or more internal channels being open to at least one of the outer edges.

2. The device of claim 1 further comprising a filtration membrane material pre-coated on each of the two sheets of substrate material before they are bonded together or coated on outer surfaces of the two sheets of substrate material after they are bonded together.

3. The device of claim 1 wherein the membrane material has a pore size in the microfiltration range or smaller.

4. The device of claim 3 wherein the membrane material has a pore size in the nanofiltration range or smaller.

5. The device of claim 1 wherein the one or more depressions are generally free-standing and permanent features of the at least one sheet of substrate material.

6. The device of any of claims 1 to 5 wherein the substrate material is a non-woven textile.

7. The device of any of claims 1 to 6 wherein the one or more depressions are free-standing features of shape molded into the at least one of the sheets of substrate material having one or more depressions.

8. The device of any of claims 1 to 7 wherein the one or more internal channels are generally cylindrical and have an inside diameter of between 0.1 mm and 50 mm.

9. The device of any of claims 1 to 8 wherein the two sheets of substrate material are bonded together between the one or more internal channels directly or through an insert .

10. The device of any of claims 1 to 9 wherein the two sheets of a substrate material are bonded together by a thermoplastic or a resin such as an MMA, epoxy or a PUR hot melt adhesive, or by welding such as laser welding.

11. A filtration module comprising a bundle of the device of any of claims 1 to 10.

12. The filtration module of claim 11 wherein edges of the device that are open to the one or more internal channels are potted into a header.

13. The filtration module of claim 11 wherein adjacent devices in the bundle are separated by a spacer, by a potting material, or both.

14. The filtration module of claim 13 wherein the adjacent devices in the bundle are separated by spacers pre-made with surfaces corresponding to the shape of a gap between adjacent devices.

15. The filtration module of claim 14 wherein the ends of the devices in the bundle and the spacers are bonded together to form a block.

16. The filtration module of claim 15 wherein the block is removably sealed to a header cavity.

17. The filtration module of claim 15 wherein the block is attached to a header cavity by a solidified sealing material.

18. The filtration device of claims 12, 16 or 17 wherein the internal channels are generally parallel to each other and generally perpendicular to the header.

19. The filtration device of claim 18 wherein the header is mounted in a cassette frame adapted to hold the filtration device in a tank with the header oriented vertically, the internal channels oriented horizontally, and with vertical gaps between adjacent devices.

20. A process for making a membrane comprising steps of,

a) inserting a piece of a substrate material into a cavity,

b) heating and cooling the piece of substrate material while pressing the piece of substrate material against an inner surface of the cavity to shape the piece of substrate material; and,

c) removing the substrate material from the die, wherein the removed substrate material has a shape corresponding to the die.

21. The process of claim 20 wherein the substrate material is a porous non-woven textile.

22. The process of claim 20 or 21 wherein the cavity has a series of parallel spaced depressions.

23. The process of any of claims 20 to 22 further comprising bonding two of the shaped sheets together to provide a structure having one or more internal channels open to at least one edge of the structure.

24. The process of any of claims 20 to 23 further comprising a step of coating a membrane material on the structure by passing the structure in a generally downward direction though a coating die having a shape generally matching that of the structure.

25. The process of any of claims 20 to 23 further comprising a step of coating the piece of substrate material with a membrane material while the substrate material is a flat sheet before inserting the piece of substrate material into the die.

26. The process of any of claims 20 to 25 wherein the piece of substrate material is heated to a temperature above its heat deflection temperature and cooled to below its heat deflection temperature while the substrate material is pressed against the inner surface of the cavity.

CLAIMS

1. A device comprising,

two sheets of a substrate material, at least one of the sheets of substrate material having depressions extending to an edge of the at least one of the sheets of substrate material, the two sheets of substrate material bonded together along their outer edges except where the depressions extend to the outer edges,

whereby the depressions form internal channels between the two sheets of substrate material, the internal channels being open to at least one of the outer edges; and

the two sheets of substrate material are bonded together along one or more lines between the interior channels.

2. The device of claim 1 further comprising a filtration membrane material pre-coated on each of the two sheets of substrate material before they are bonded together or coated on outer surfaces of the two sheets of substrate material after they are bonded together.

3. The device of claim 2 wherein the membrane material has a pore size in the microfiltration range or smaller.

4. The device of claim 3 wherein the membrane material has a pore size in the nanofiltration range or smaller.

5. The device of claim 1 wherein the depressions are generally free-standing and permanent features of the at least one sheet of substrate material.

6. The device of any of claims 1 to 5 wherein the substrate material is a non-woven textile.

7. The device of any of claims 1 to 6 wherein the depressions are free-standing features of

shape molded into the at least one of the sheets of substrate material having depressions.

8. The device of any of claims 1 to 7 wherein the internal channels are generally cylindrical and have an inside diameter of between 0.1 mm and 50 mm.

9. The device of any of claims 1 to 8 wherein the two sheets of substrate material are bonded together between the internal channels directly or through an insert.

10. The device of any of claims 1 to 9 wherein the two sheets of a substrate material are bonded together by a thermoplastic or a resin, epoxy or a PUR hot melt adhesive, or by welding.

11. The device of claim 10 wherein the two sheets of a substrate material are bonded together by MMA.

12. The device of claim 10 wherein the two sheets of a substrate material are bonded together by laser welding.

13. A filtration module comprising a bundle of the device of any of claims 1 to 12.

14. The filtration module of claim 13 wherein edges of the device that are open to the internal channels are potted into a header.

15. The filtration module of claim 13 wherein adjacent devices in the bundle are separated by a spacer, by a potting material, or both.

16. The filtration module of claim 15 wherein the adjacent devices in the bundle are separated by spacers pre-made with surfaces corresponding to the shape of a gap between

adjacent devices.

17. The filtration module of claim 16 wherein the ends of the devices in the bundle and the spacers are bonded together to form a block.

18. The filtration module of claim 17 wherein the block is removably sealed to a header cavity.

19. The filtration module of claim 17 wherein the block is attached to a header cavity by a solidified sealing material.

20. The filtration device of claims 14, 18 or 19 wherein the internal channels are generally parallel to each other and generally perpendicular to the header.

21. The filtration device of claim 20 wherein the header is mounted in a cassette frame adapted to hold the filtration device in a tank with the header oriented vertically, the internal channels oriented horizontally, and with vertical gaps between adjacent devices.

22. A process for making a device of claim 1 comprising steps of,

a) inserting a piece of a substrate material into a cavity,

b) heating and cooling the piece of substrate material while pressing the piece of substrate material against an inner surface of the cavity to shape the piece of substrate material,

c) removing the substrate material from the die, wherein the removed substrate material has a shape corresponding to the cavity, and

d) bonding the shaped sheet of the substrate material together with another sheet of a

substrate material to provide a structure having internal channels open to at least one edge of the structure.

23. The process of claim 22 wherein the substrate material is a porous non-woven textile.

24. The process of claim 22 wherein the cavity has a series of parallel spaced depressions.

25. The process of any of claims 22 to 24 further comprising a step of coating a membrane material on the structure by passing the structure in a generally downward direction through a coating die having a shape generally matching that of the structure.

26. The process of any of claims 22 to 24 further comprising a step of coating the piece of substrate material with a membrane material while the substrate material is a flat sheet before inserting the piece of substrate material into the die.

27. The process of any of claims 22 to 24 wherein the piece of substrate material is heated to a temperature above its heat deflection temperature and cooled to below its heat deflection temperature while the substrate material is pressed against the inner surface of the cavity.