[0031] **FIG. 7** is a schematic illustration of a microchannel distillation unit that can be used in accordance with the inventive process.

[0032] **FIG. 8** is a schematic illustration of a microchannel distillation unit that can be used in accordance with the inventive process.

[0033] **FIG. 9** is a schematic illustration of a microchannel condenser that can be used with the inventive process.

[0034] **FIG. 10** is a schematic illustration of the microchannel condenser illustrated in **FIG. 9** taken along line I-I in **FIG. 9**.

[0035] **FIG. 11** is a schematic illustration of the microchannel condenser illustrated in **FIG. 9** taken along line II-II in **FIG. 9**.

[0036] **FIG. 12** is a schematic illustration of a microchannel reboiler that can be used with the inventive process.

[0037] **FIG. 13** is a schematic illustration of the microchannel reboiler illustrated in **FIG. 12** taken along line I-I in **FIG. 12**.

[0038] **FIG. 14** is a schematic illustration of the microchannel reboiler illustrated in **FIG. 12** taken along line II-II in **FIG. 12**.

[0039] **FIG. 15** is a schematic illustration of a microchannel reboiler that can be used with the inventive distillation process.

[0040] **FIG. 16** is a schematic illustration of the microchannel reboiler illustrated in **FIG. 15** taken along line I-I in **FIG. 15**.

[0041] **FIG. 17** is a schematic illustration of the microchannel reboiler illustrated in **FIG. 15** taken along line II-II in **FIG. 15**.

[0042] **FIG. 18** is a schematic illustration of a microchannel distillation unit that can be used in accordance with the inventive process.

[0043] **FIG. 19** is a schematic illustration showing a process using the inventive microchannel distillation units for separating water, butanes or butylenes, propanes or propylenes, and ethane or ethylene, from raw natural gas.

DETAILED DESCRIPTION

[0044] The term "microchannel" refers to a channel having at least one internal dimension of height or width of up to about 10 millimeters (mm), and in one embodiment up to about 5 mm, and in one embodiment up to about 2 mm, and in one embodiment up to about 1 mm. In one embodiment, the height or width is in the range of about 0.01 to about 10 mm, and in one embodiment about 0.05 to about 5 mm, and in one embodiment about 0.05 to about 2 mm, and in one embodiment about 0.05 to about 1.5 mm, and in one embodiment about 0.05 to about 1 mm, and in one embodiment about 0.05 to about 0.75 mm, and in one embodiment about 0.05 to about 0.5 mm. Both height and width are perpendicular to the direction of flow through the microchannel.

[0045] The term "adjacent" when referring to the position of one channel relative to the position of another channel means directly adjacent. In one embodiment, a wall may separate the two channels, in part or in whole. This wall may vary in thickness. In one embodiment, a process microchannel and a liquid channel may be in fluid contact with one another. For example, a process microchannel may have an opening exposed to the wicking region of a liquid channel. However, "adjacent" channels are not separated by an intervening channel that would interfere with heat transfer between the channels.

[0046] The terms "upstream" and "downstream" refer to positions within the process microchannels used in the inventive process that are relative to the direction of flow of the vapor phase through the process microchannels. For example, a position within the process microchannels not yet reached by a portion of the vapor phase flowing toward that position would be downstream of that portion of the vapor phase. A position within the process microchannels already passed by a portion of the vapor phase flowing away from that position would be upstream of that portion of the vapor phase. The upstream and downstream positions for the microdistillation unit illustrated in **FIG. 10** are relative to the direction of flow of the vapor phase in the vapor channels **540** and **540***a*. The terms "upstream" and "downstream" do not necessarily refer to a vertical position since the process microchannels used in the inventive process may be oriented horizontally, vertically or at an inclined angle.

[0047] The term "capture structure" refers to a structure positioned within a channel that captures liquid and permits vapor to flow through it.

[0048] The term "wick" refers to medium for drawing off liquid by capillary action.

[0049] The term "wicking region" refers to a space occupied by a wick and/or a wicking surface (e.g., a grooved surface).

[0050] The term "fluid" refers to a gas, a liquid, or a gas or a liquid containing dispersed solids, or a mixture thereof. The fluid may be in the form of a liquid containing dispersed liquid droplets. The fluid may be in the form of a gas containing dispersed liquid droplets.

[0051] The inventive process will be described initially with reference to **FIG. 1**. Referring to **FIG. 1**, a distillation process **100** is provided for distilling a fluid mixture containing components X and Y. Component Y is more volatile than component X. The distillation process **100** employs microchannel distillation column or apparatus **110**, which includes microchannel condenser **120**, and microchannel reboiler **130**. The distillation column or apparatus **110** contains one or more of the inventive microchannel distillation units which are provided for separating component X from component Y. Each of the microchannel distillation units comprises a plurality of microchannel distillation sections. In operation, a feed F comprising a fluid mixture comprising components X and Y enters distillation column or apparatus **110**, as indicated by arrow **112**. Within the distillation column or apparatus **110** a vapor phase flows through a series of microchannel distillation sections in a direction towards the microchannel condenser **120** and a liquid phase flows through a series of microchannel distillation sections in a direction towards the microchannel reboiler **130**. In each microchannel distillation section the vapor phase and the liquid phase contact each other with the result being a mass transfer between the phases. In each microchannel distilla-