cylindrical vessel **211**. Cylindrical vessel **211** may be a pressurized vessel. Alternatively, the microchannel distillation column or apparatus **210** may not be surrounded by a contiguous vessel, and may maintain pipe connections for each inlet and outlet port. The microchannel distillation column or apparatus **210** and accompanying pipe connections for flow into or out of the microchannel distillation column or apparatus **210** may be considered to comprise the microchannel distillation assembly **200**. Each microchannel distillation column or apparatus **210** may comprise a plurality of the microchannel distillation units **212** and heat exchange channels **214** illustrated in **FIG. 12**. Any number of microchannel distillation units **212** may be used in each microchannel distillation column or apparatus **210**, for example, one, two, three, four, six, eight, ten, tens, hundreds, thousands, etc. Each microchannel distillation unit **212** may have an adjacent heat exchange channel **214**, although some of the process microchannel distillation units **212** may have more than one adjacent heat exchange channel **214** while other microchannel distillation units **212** may not have any adjacent heat exchange channels **214**. A single heat exchange channel **214** may provide heating and/or cooling for more than one microchannel distillation unit **212**. For example, the heating and/or cooling of from 1 to about 20 microchannel distillation units **212**, and in one embodiment 1 to about 10, and in one embodiment 1 to about 5, and in one embodiment 1 to about 3 microchannel distillation units **212** may be provided by a single heat exchange channel **214**. Each microchannel distillation unit **212** may comprise a plurality of microchannel distillation sections (or stages) **220**. Each of the microchannel distillation column or apparatus **210** may have at least one feed inlet **230**, a distillate end **240** and a bottoms end **250**. Each microchannel distillation column or apparatus **210** may be used in combination with a microchannel condenser **260** and a microchannel reboiler **270**. In one embodiment, the microchannel distillation column or apparatus **210** may be used in combination with a microchannel condenser **260**, but not a microchannel reboiler **270**. In one embodiment the microchannel distillation column or apparatus **210** may be used in combination with a microchannel reboiler **270**, but not a microchannel condenser **260**. The microchannel distillation assembly **200** may include a distillate product receiving cavity **280** and a bottoms product receiving cavity **285**. The microchannel distillation assembly **200** may include feed inlet **291**, bottoms product outlet **292**, distillate product outlet **293**, distillate exhaust outlet **294**, heat exchange fluid inlets **295** and **296**, and heat exchange fluid outlets **297** and **298**. When more than one microchannel distillation column or apparatus **210** is used in the microchannel distillation assembly **200**, the cavities **280** and **285** may be individualized for each of the microchannel distillation columns or apparatuses **210**, or cavities that are common to more than one, and in one embodiment all of the microchannel distillation column or apparatus **210** in the microchannel distillation assembly **200**, may be used. Similarly, with reference to **FIGS. 4 and 5**, when more than one microchannel distillation column or apparatus **210** is used in the microchannel distillation assembly **200**, the feed inlets **291** (and **291***i*, **291***ii* and **291***iii* not shown in **FIG. 4**), bottoms outlets **292** (and **292***i*, **292***ii* and **292***iii*), distillate product outlets **293** (and **293***i*, **293***ii* and **293***iii*), distillate exhaust outlets **294** (and **294***i*, **294***ii* and **294***iii*), and heat exchange fluid inlets **295** (and **295***i*, **295***ii* and **295***iii*), **296** (and **296***i*, **296***ii* and **296***iii*), and heat exchange fluid outlets **297** (and **297***i*, **297***ii*, **297***iii*), and **298** (and **298***i*, **298***ii* and **298***iii*) may be individualized for each of the microchannel distillation columns or apparatuses **210**, as illustrated in **FIG. 4**, or inlets and/or outlets that are common to more than one, and in one embodiment all of the microchannel distillation columns or apparatuses **210** in the microchannel distillation assembly **200** may be used. This may involve the use of flow channels and manifolds for conducting the flow of the various fluids to and from the microchannel distillation columns or apparatuses **210**. This is shown in **FIG. 6** wherein the microchannel assembly **200** employs manifolds **201**, **202**, **203** and **204** for the flow of feed, product and heat exchange fluids into or out of the microchannel distillation columns or apparatuses **210**. Reference is herein made to PCT International Application No. PCT/US05/03904, filed Feb. 7, 2005, wherein multiple microchannel units or modules positioned within cylindrical vessels which employ common inlets and outlets are disclosed; this application is incorporated herein by reference.

[**0094**] **FIG. 3** discloses microchannel distillation assembly **200***a* which is an alternate embodiment of the microchannel distillation assembly **200** shown in **FIG. 2**. The microchannel distillation assembly **200***a* depicted in **FIG. 3** is the same as the embodiment microchannel distillation assembly **200** depicted in **FIG. 2** with the exception that the assembly **200***a* shown in **FIG. 3** does not include a distillate product receiving cavity **285**. Consequently, the distillate product flows out of the microchannel condenser **260**, as indicated by arrow **262***a*.

[**0095**] The process using the microchannel distillation assemblies **200** and **200** a illustrated in **FIGS. 2 and 3**, respectively, may be conducted as follows. A feed stream F comprising a fluid mixture enters microchannel distillation assembly **200** or **200***a* through inlet **291** and microchannel distillation column or apparatus **210** through feed port **230**, as indicated by arrow **232** (see, **FIGS. 2, 3** and **5**). The fluid mixture (i.e., gas, liquid or a mixture of gas and liquid) may comprise a mixture of a more volatile component Y and a less volatile component X. Within each microchannel distillation column or apparatus **210***a* vapor phase flows through a plurality of microchannel distillation sections **220** in microchannel distillation unit **212** in a direction indicated by arrows **216** towards the distillate end **240**, and a liquid phase flows through a plurality of microchannel distillation sections **220** in a direction indicated by arrows **218** towards the bottoms end **250** (see, **FIGS. 2, 3** and **12**). In each microchannel distillation section **220** the vapor phase and the liquid phase contact each other with the result being a mass transfer between the phases. In each microchannel distillation section **220** part of the more volatile component Y transfers from the liquid phase to the vapor phase, and part of the less volatile component X transfers from the vapor phase to the liquid phase. The vapor phase, which is progressively enriched with the more volatile component Y, flows through microchannel distillation column or apparatus **210** towards the distillate end **240** and into the microchannel condenser **260**. The liquid phase, which is progressively enriched with the less volatile component X, flows through the microchannel distillation column or apparatus **210** towards the bottoms end **250** and into the microchannel reboiler **270**. The vapor phase is condensed in the microchannel condenser **260** to form distillate product D. Part of the distillate product D, which may be referred to as an overhead product, may be withdrawn from the microchannel