coefficient and the flow rate of fluid having a relatively low affinity to the wall surface of the fine channel and when the minimum distance between adjacent partition walls in a flowing direction of fluid is fixed to a predetermined distance or less (i.e., about 400 μm or less, preferably, about 200 μm or less), each flow of fluid can be discharged from an outlet port through the fine channel without causing the mutual contamination of fluid even though there are some fluctuations in the product of the viscosity coefficient and the flow rate of fluid having a relatively high affinity to the wall surface of the fine channel to the ratio of the product of the viscosity coefficient and the flow rate of fluid having a relatively low affinity to the wall surface of the fine channel.

[0182] Further, according to the present invention, the inner structure of the fine channel can be formed at the same time of the formation of the shape of the fine channel by using etching, mechanically processing or molding without requiring a large number of processes as in a conventional channel modification method. Accordingly, a time and cost for forming the fine channel can remarkably be reduced in comparison with the channel modification method. In particular, when the fine channel device of the present invention is fabricated by molding a material such as a resin, ceramics or glass, the effect of reducing the time and cost for forming the fine channel can be obtained at the maximum.

[0183] The above-mentioned effects depend basically on the shape of the fine channel formed in the fine channel device of the present invention. Accordingly, such effects can be realized only by the fine channel device of the present invention in which a fine channel capable of providing semipermanently services is formed. Further, since the partition wall located closest to the branch portion of the fine channel is connected to the branch portion, at least two kinds of fluid flowing adjacently can be separated smoothly to thereby suppress mutual contamination of fluid.

[0184] Further, when the fine channel of the present invention has a shape other than a straight shape, a partition wall portion in the portion having a shape other than a straight shape extends from the vicinity of a portion originating a non-straight portion of fine channel to the vicinity of a portion ending the non-straight portion of fine channel. Accordingly, such a phenomenon that a kind of fluid flowing an inner side of a curved fine channel is forced to push the other kind of fluid flowing at an outer side due to a centrifugal force to thereby cause contamination of fluid, can be prevented.

[0185] Further, when flow rates of all kinds of fluid to be supplied to the fine channel are the same, distances between adjacent partition walls arranged in a flowing direction of fluid are made smaller than a predetermined distance whereby these kinds of fluid having the same viscosity can be discharged at a predetermined range of flow rate from each outlet port through each outlet channel without causing mutual contamination of fluid.

[0186] Further, in two adjacent flows of fluid flowing in the fine channel, when the product of the viscosity coefficient and the flow rate of a fluid having a relatively high affinity to the wall surface of the fine channel is different from the product of the viscosity coefficient and the flow rate of a fluid having a relatively low affinity to the wall surface of the fine channel, the minimum distance between adjacent partition walls arranged in a flowing direction of fluid should be smaller than a predetermined distance. With such arrangement, even when the product of the viscosity coefficient and the flow rate of a fluid having a relatively high affinity to the wall surface of the fine channel, to the product of the viscosity coefficient and the flow rate of a fluid having a relatively low affinity to the wall surface of the fine channel varies about 30-40%, each flow of fluid can be discharged from each outlet port through each outlet channel without causing mutual contamination of fluid. Further, even in a case that the viscosity of each kind of fluid fluctuates in the progress of a chemical reaction and if the fluctuation of the viscosity is within the above-mentioned range, a stable fluid boundary formed by laminar flows of fluid can be maintained, and each fluid can be discharged from each outlet port through each outlet channel without causing mutual contamination of fluid.

[0187] In the fine channel device of the present invention, the affinity of the inner wall at one side of the fine channel partitioned by partition walls is different from the affinity of the inner wall at the other side of the fine channel partitioned by the partition walls. Accordingly, it is possible to suppress effectively a wraparound phenomenon that a kind of fluid having the affinity to the inner wall of the fine channel surrounds another kind of fluid without having the affinity to the inner wall of the fine channel. Then, the supplied fluid can certainly be separated and discharged from each outlet port without causing mutual contamination of fluid.

[0188] In addition to the above-mentioned effects obtainable only by the fine channel device of the present invention, the following accompanying effects can be expected.

[0189] In a first accompanying effect, since at least two kinds of fluid can effectively be separated from each other after they are passed through the fine channel without causing mutual contamination, a contact time, i.e., a mixing time and/or a chemical reaction time of said at least two kinds of fluid flowing adjacently in the fine channel, the contact time being determined by the length of the fine channel and/or a flow rate of fluid, can be determined only in the fine channel. Accordingly, the mixing and/or a chemical reaction can be stopped in the fine channel, and an intended chemical reaction can be realized without causing a consecutive reaction or a side reaction in the fine channel. Further, it is possible to recover a catalyst after a catalytic reaction while the activity of the catalyst can be maintained.

[0190] In a second accompanying effect, since at least two kinds of fluid flowing as adjacent laminar flows can effectively be separated and discharged without causing mutual contamination, a solvent extraction time can correctly controlled by the length of the fine channel and/or a flow rate of these fluid. Accordingly, the solvent extraction can be stopped only in the fine channel, and an extracting solvent in the fine channel can effectively be separated from an extracted solvent at the outside of the fine channel.

[0191] In a third accompanying effect, since a film is formed at the fluid boundary formed by at least two kinds of fluid as adjacent flows in the fine channel, selective permeability of a material in a kind of fluid through the film between two kinds of fluid adjacently flowing in the fine channel can be provided. Or, when a catalytic reaction or an enzyme reaction is carried out, a catalyst or an enzyme is immobilized on the film which is formed in the fine channel having a practical length of from several cm to several tens cm.