they travel down the channel allows for greater opportunities to observe and manipulate interactions between particles of the first and second types.

[0174] While the illustrated geometry for achieving the effects described with respect to FIG. **9** has an aspect ratio of 2 to 1, there is a range of substantially non-1-to-1 aspect ratios for which these effects may be observed. First, as noted above, the effects may be seen regardless of whether it is the width or the height that is twice the other dimension. Of course, the reduction in symmetry for rectangular channels for focusing into two stream lines rather than four will occur so that two longer sides will have focused stream lines of particles that are centered along and spaced apart from the walls. In addition to ratios of about 1 to 2, this reduction in symmetry can be observed in rectangular channels having dimensional ratios of approximately 15 to 50, 3 to 5, and 4 to 5. Accordingly, the effects can be seen for a dimensional aspect ratio of approximately 0.3 (15/50) to a dimensional aspect ratio of approximately 0.8 (4/5), and that the effects can be seen regardless of whether the longer dimension is the width or the height.

[0175] Curving channels having a sigmoidal shape are also provided, and as previously noted, FIGS. **3**A and **3**B illustrate one embodiment of such a curving channel. Referring now to FIGS. **10**A-**10**C, the separation, ordering, and focusing of particles within these exemplary sigmoidal channels will be discussed in more detail. Within curving channel systems, symmetry can be reduced by additional inertial forces arising from the particles and fluid. These forces can act in superposition with the lift forces to change equilibrium positions of particles flowing within the fluid. The additional inertial forces generally act in the plus and minus y directions in microfluidic channels with a curving symmetric or sigmoidal geometry, as previously illustrated in FIG. **3**B. This geometry can bias the two stable positions on the sides of a channel **100** and can reduce the number of particles collected at the top and bottom focusing points. When the force is sufficient to bias the direction, only two lines of focused particles **102***a*, **102***b* occur, as shown in FIGS. **10**A and **10**B. As shown in FIG. **10**B, particles are randomly distributed in the channel **100** at an inlet **104**. As R_c increases between 0.5 and 5, focusing into two streams **102***a*, **102***b* can occur. As R_c increases, mixed streams are again observed, in agreement with an increased contribution from Dean drag.

[0176] An asymmetric curving geometry, such as that previously illustrated in FIG. **4**A, can lead to a further reduction in symmetry of particle focusing. Referring now to FIGS. **11**A-**11**D, an exemplary channel **110** having an asymmetric configuration will be discussed. In an asymmetrically shaped channel, the net force generally acts in one direction, biasing a single stable position of the initial distribution, and creating a single focused stream of particles **112**, as shown in FIGS. **11**A-**11**D. FIGS. **11**A and **11**B illustrate that a time-averaged unidirectional centrifugal and/or drag force favors focusing down to a single stream between R_e=1–15. As shown, focusing becomes more complex as D_e increases. FIG. **11**C further illustrates that particles are focused to one position of minimum potential with the addition of centrifugal forces or drag forces in the −x direction. Complete focusing can also occur for much smaller R_p~0.15 and for shorter traveled distances (~3 mm), as shown in FIG. **11**D, than in the case of straight rectangular channels. This may partly be due to the mixing action of the Dean flow allowing particles to sample the stable regions of the flow more quickly. FIG. **11**D also illustrates the state of the particles in a random distribution near an inlet **114** of the asymmetrically curved channel **110**, a second distribution near turn 7 of the channel, and finally the tightly focused stream of particles **112** near the outlet of the channel.

[0177] Another exemplary asymmetric geometry can include an expanding spiral shaped geometry as previously shown in FIG. **4**C. Referring now to FIGS. **12** and **13**, aspects of an exemplary spiral shaped channel **120** will now be discussed. As described above, in a system with inertial lift alone, shear-induced lift forces pushing the particles towards the walls can be balanced by the wall-induced inertia pushing particles away from the wall into an equilibrium position close to the walls. In one embodiment, two significant geometrical features result in equilibrium particle focusing for high-aspect ratio geometry and curvature. For high-aspect ratio geometry, the probability of finding a particle balanced by the inertial forces close to a roof **122** and bottom **124** along the channel **120** width is always greater than close to the inner of outer walls. Thus particles suspended within a sample will tend to focus towards two focusing positions **126***a*, **126***b*, as shown in FIG. **12**. The curvature introduces Dean drag that will push the particles in different transversal directions depending on position. As illustrated previously in FIG. **6**A, the velocity field shown in arrows illustrates the magnitude and direction of the effect to a particle. For example, a particle located in the center will be pushed towards the outer wall and recirculated through the outer edge roof or bottom until the particles reach the equilibrium position near the inner wall where the Dean forces are superimposed to the inertial forces from the inner walls, as shown in FIG. **12**. Hence, in one embodiment, the main forces impacting the particle focusing in the channel height direction may be inertial lift forces, while the Dean forces have a strong influence on the lateral positioning of particles. A particle can remain focused as long as the Dean force trying to push the particle away from the inner wall is balanced by the inertia lift force from the inner wall trying to push the particle towards the inner wall. This results in particles focusing in single-stream lateral positions in two parallel symmetric streams along the height of the channel. In addition to focusing, particles are ordered in uniform spacing in the direction of the flow as shown in FIG. **13**. High-speed camera experiments reveal that the ordered particles flow in the same stream line **128**, either in the bottom **124** or roof **122**, or in alternating particle trains. The behavior seems to be random, and the spacing between the ordered alternating particle trains is always shorter compared to the spacing in the same streamline for the particle concentrations used.

[0178] Referring now to FIG. **14**, any of the exemplary channels described above can be included in various system configurations as needed for any number of applications. In general, however, FIG. **14** illustrates one embodiment of such a system **200** having a plurality of channels **202** for the ordering and focusing of particles as described above. As shown, the system **200** can generally include an inlet **206** having one or more inlet channels **204***a*, **204***b* that can be configured for introducing a sample having particles suspended therein into the system **200** through a filter mechanism **208**. A pumping mechanism **210** can also be included and can be associated with the inlet **206** and/or with an outlet **212** for introducing a sample into the system **200** under positive or negative pressure.

[0179] A microfabricated chip **214** can be provided and can have any number and configurations of any of the channels