effectively separated. In this exemplary system, close to 100% separation of 10-μm beads is provided, as shown in FIG. **35**F, at a flow rate of 3.5 ml/min.

Example 19

[0246] FIG. **36** illustrates utilizing inertial focusing for particle separation. An input solution of 0.1% w/v of mean diameter 3.87 μm (4) and 7.32 μm (7), uniformly distributed, was introduced into a single asymmetric device 100 (narrow)-160 (wide) μm in width, 50 μm tall, and 3 cm in length. At the outlet the channel was split into 5 exit channels with equivalent resistance and fractions were collected for a flow at Re~8. Flow of a total of 1 mL of solution over 10 minutes allowed ample sample for analysis by coulter counter. Histograms of particle sizes are shown for each of these fractions (numbers 1-5 and indicated in the image). The volumetric ratio between 4 (3-5 μm) and 7 (6-8.5 μm) micrometer particles is shown above each histogram. Notably in fraction **2** the larger particles are enhanced two-fold while in fraction **5** the larger particles are depleted ~200 times.

Example 20

[0247] FIG. **37** illustrates focusing behavior in symmetric curving channels. As R_e number increases from 0.5 to 5 a transition to two focused streams is observed. As R_e is increased further stable but more complex behavior is observed. Scale bar is 50 μm.

Example 21

[0248] FIG. **38** illustrates the dependence of particle focusing on a/D_h. Streak images at the outlet are shown 3 cm downstream of the inlet for a flow at Re=100. The image is shown at the recombination of two branches to illustrate the uniformity of the flow profile from channel to channel.

Example 22

[0249] FIG. **39** illustrates focusing behavior for channels of 35 μm to 65 μm width. The average radius of curvature for the small dimension is 32.5 μm. Focusing to a single stream is observed ~R_e of 5 while focusing to two streams is observed at higher R_e and at lower Re number. The particle diameter is 10 μm. Scale bar is 50 μm.

Example 23

[0250] FIG. **40** illustrates focusing behavior for channels of 50 μm to 80 μm width. The average radius of curvature for the small dimension is 40 μm. Focusing to a single stream is observed ~R_e of 2.5 while focusing to two streams is observed at higher R_e. Above R_e=25 more complex but stable behavior is observed. The particle diameter is 10 μm. Scale bar is 50 μm.

Example 24

[0251] FIG. **41** illustrates focusing behavior for channels of 100 μm to 160 μm width. The average radius of curvature for the small dimension is 80 μm. Focusing to a single stream is observed ~R_e of 12 while more complex but stable behavior is observed for higher R_e. The particle diameter is 10 μm. Scale bar is 100 μm.

Example 25

[0252] FIG. **42** illustrates focusing behavior for channels of 350 μm to 650 μm width. The average radius of curvature for the small dimension is 325 μm. Focusing to a single stream is observed ~R_e of 90 while more complex but stable behavior is observed for higher R_e. The particle diameter is 10 μm. Scale bar is 100 μm.

Example 26

[0253] FIG. **43** illustrates particle dependent focusing for separation. A uniform mixture 10 μm and 2 μm particles was input at the inlet and fluorescent streak images were observed at the outlet for (A) the green fluorescent 10 μm particles and (B) the red fluorescent 2 μm particles. The flow is at a R_e of 5. There is a distinct separation across streamlines for the different size particles with no externally applied forces. The scale bar is 50 μm.

Example 27

[0254] FIG. **44** illustrates focusing of blood cells in the same manner as rigid particles. Five percent whole blood diluted in PBS is run through rectangular channels of 50 μm width. At the outlet, 3 cm downstream, streak images of cells are observed in phase contrast. These appear as dark streams in the gray channel. The channel edges are also dark. As in the case with rigid particles **3** streaks are observed which correspond to four focus points on the rectangular channel faces.

Example 28

[0255] FIGS. **45**A and **45**B illustrate focusing of cultured cell lines. As with particles, deformable cells are focused to single streams. FIG. **43**A shows streak images of cells focusing for various R_e numbers are shown. The inlet of each focusing area is shown on the left. Focusing to a single lane starts to occur for R_e~2 after 3 cm of travel. In FIG. **43**B, intensity cross sections at various turns and at the outlet are shown. Note that at the outlet the width of the focused stream is comparable to the diameter of a single cell (~15 μm).

[0256] Experimental Conditions and Apparatus

[0257] While many experimental conditions can be used to create and utilize the exemplary systems described herein, some conditions used to achieve the results discussed above are presented below.

[0258] Materials

[0259] Fluorescent polystyrene microparticles (density~1.05 g/ml) were either purchased from Bangs Laboratories (Fishers, Ind.) or Duke Scientific (Fremont, Calif.). For 4 (3.87) μm and 7 (7.32) μm particles the Bangs Labs product codes were FS05F/7772 and FS06F/6316 respectively. For 2 (2.0)μm, 9 μm, 10 (9.9) μm and 17 μm the Duke Scientific product numbers were R0200, 36-3, G1000 and 35-4. Particles were mixed to desired weight fractions by dilution in Phosphate buffered saline (PBS) and stabilized by addition of 0.1% Tween 20. Particles were mixed to desired weight fractions by dilution in PBS and stabilized by addition of 0.1% Tween 20. In the various described experiments particle wt/vol % varied between 0.1% and 1%. Silicone oil droplets were formed from 10% wt/vol DC 200 (10 centistokes, Dow Corning) stabilized with 2% wt/vol polyethylene glycol monooleate (molecular weight 860, SigmaAldrich). The mixture was shaken vigorously and allowed to settle for 20 min. Solution was taken from the bottom 1 cm of the vial to ensure