CLAIMS

1. A device for sorting, separating or manipulating particles in a fluid suspension, the device comprising:

(a) at least one inlet for introducing the fluid suspension;

(b) at least one outlet for discharging the fluid suspension containing particles of a desired size; and

(c) a channel in fluid communication with and intermediate the at least one inlet and the at least one outlet, a portion of the channel is curved to form at least one curved unit, the curved unit is shaped to form a profile of a wave having a crest, a lip that curls over a trough, and a face,

wherein the crest, lip, face and trough of the curved unit each forms a semicircular arc segment, the fluid suspension travels through the curved unit from the semicircular arc segment of the crest to the semicircular arc segment of the trough.

2. The device according to claim 1, wherein the diameter of the semicircular arc segment of the trough is equal to or greater than the diameter of the semicircular arc segment of the crest.

3. The device according to claim 2, wherein the diameter of the semicircular arc segment of the trough is between 200 µm to 1200 µm.

4. The device according to any one of the preceding claims, wherein the channel comprises a plurality of curved units.

5. The device according to claim 4, wherein the plurality of curved units are arranged in a linear direction.

6. The device according to any one of claims 4 or 5, wherein the plurality of curved units comprises between 10 to 40 curved units.

7. The device according to any one of the preceding claims, wherein the at least one outlet further comprises three outlets, a first, second and third outlet.

8. The device according to any one of the preceding claims, wherein the widths of the first, second and third outlets are different.

9. The device according to claim 8, wherein the width of the first, second and third outlets are 30–80 µm, 40-55 µm and 30-80 µm respectively.

10. The device according to any one of the preceding claims, wherein the main channel has a rectangular cross-section profile.

11. The device according to claim 10, wherein the main channel has a width of 20-125 µm and a height of 5-40 µm.

12. The device according to any one of the preceding claims, wherein each of the inlet and the at least one outlet further comprises a reservoir, the diameter of the reservoir is 1.5 mm.

13. The device according to any one of the preceding claims, wherein the diameter of the semicircular arc segment of the crest is between 600 to 800 µm, the diameter of the semicircular arc segment of the face is between 200 to 350 µm, the diameter of the semicircular arc segment of the lip is between 200 to 350 µm, and the diameter of the semicircular arc segment of the trough is between 600 µm to 1200 µm.

14. A method for sorting, separating or manipulating particles in a fluid suspension, the method comprising:

(a) providing at least one inlet for introducing the fluid suspension;

(b) providing at least one outlet for discharging the fluid suspension containing particles of a desired size;

(c) a main channel in fluid communication with and intermediate the at least one inlet and the at least one outlet, a portion of the main channel is curved to form at least one curved unit, the curved unit is shaped to form a profile of a wave having a crest, a lip that curls over a trough, and a

face, wherein the crest, lip, face and trough of the curved unit each forms a semicircular arc segment; and

(d) pumping the fluid suspension through the curved unit from the semicircular arc segment of the crest to the semicircular arc segment of the trough.

15. The method according to claim 14, further comprising pumping the fluid suspension through the curved unit wherein the diameter of the semicircular arc segment of the trough is equal to or greater than the diameter of the semicircular arc segment of the crest.

16. The method according to any one of claims 14 or 15, further comprising pumping the fluid suspension through a plurality of curved units that are arranged in a linear direction, the plurality of curved units comprises between 10 to 40 curved units.

17. The method according to any one of claims 14 to 16, further comprising pumping the fluid suspension at a flow rate of between 40 µl/min to 200 µl/min.

18. The method according to any one of claims 14 to 17, wherein the diameter of the semicircular arc segment of the crest is between 600 to 800 µm, the diameter of the semicircular arc segment of the face is between 200 to 350 µm, the diameter of the semicircular arc segment of the lip is between 200 to 350 µm, and the diameter of the semicircular arc segment of the trough is between 600 µm to 1200 µm.

19. The method according to any one of claims 14 to 18, further comprising discharging the fluid suspension in three outlets, a first, second and third outlet.

20. The method according to claim 19, further comprising discharging the fluid suspension containing particles having a size of about 3 µm to 10 µm at the first outlet, discharging the fluid suspension containing particles having a size of about 15 µm at the second outlet, and discharging the fluid suspension containing particles having a size of about 3 µm at the third outlet.

21. The method according to any one of claims 14 to 20, wherein the fluid suspension is a whole blood sample and the method separates cancer cells from the sample, separate different types of blood cells or separate submicron vesicles and exosomes from the fluid suspension sample.

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22. The method according to any one of claims 14 to 21, wherein the method separates particles having a size of about 300 nm from particles having a size of about 100 nm.