CLAIMS

1. A method of controlling and separating the flow of a multiphase fluid stream, the method comprising:

introducing the multiphase fluid stream into a separation zone, wherein the fluid stream is introduced into the separation zone through an inlet extending at an angle to the radius of the separation zone, thereby generating a rotational flow pattern of the fluid within the separation zone;

allowing separation of the fluid phases in the fluid stream to occur in the separation zone;

causing lighter fluid phases separated in the separation zone to flow through a choke element to a first outlet, the choke element being disposed within the separation zone and downstream of the inlet;

controlling the flow of fluid phases through the choke element by adjusting the choke element; and

causing the remaining fluid phases to flow to a second outlet.

~~2. A method of controlling and separating the flow of multiphase fluid streams, the method comprising:~~

~~introducing a first fluid stream rich in lighter fluid phases into a separation zone;~~

~~introducing a second fluid stream rich in heavier fluid phases into a separation zone to form a combined fluid stream in which the first fluid stream and the second fluid stream are in contact;~~

~~allowing separation of the fluid phases in the combined fluid stream to occur in the separation zone;~~

~~causing lighter fluid phases separated in the separation zone to flow through a choke element to a first outlet;~~

~~controlling the flow of fluid phases through the choke element by adjusting the choke element; and~~

~~causing the remaining fluid phases to flow to a second outlet.~~

~~3. The method according to claim 2, wherein the first fluid stream is introduced into the separation zone upstream of the second fluid stream.~~

24. The method according to ~~either of~~ claim~~s~~ ~~2 or 3~~1, wherein ~~either one or both of~~ the ~~first and second~~fluid stream~~s~~ is preconditioned prior to being introduced into the separation zone.

35. The method according to claim 2~~4~~, wherein the preconditioning comprises initiating separation of the phases in the fluid stream.

4~~6~~. The method according to any of claims 1 to 3~~5~~, further comprising subjecting the fluid passing through the choke element to further separation.

~~7. A choke assembly comprising:~~

~~a choke element for controlling the flow of fluid therethrough;~~

~~a first inlet for a lighter fluid stream;~~

~~a second inlet for a heavier fluid stream; and~~

~~at least one outlet for fluid.~~

~~8. A method for controlling the flow of fluid, the method comprising:~~

~~introducing a first, light fluid stream into a choke assembly through a first inlet;~~

~~introducing a second, heavy fluid stream into the choke assembly through a second inlet;~~

~~allowing the first and second fluid streams to come into contact;~~

~~passing fluid from the first and second streams through a choke element to control the flow of fluid; and~~

~~removing fluid from the choke assembly through at least one outlet.~~

~~9. A choke assembly comprising:~~

~~an inlet for a multiphase fluid stream;~~

~~a choke element;~~

~~a separation chamber located downstream of the choke element to receive fluid passing through the choke element;~~

~~a first outlet in the separation chamber for a first fluid stream; and~~

~~a second outlet in the separation chamber for a second fluid stream.~~

~~10. The choke assembly according to claim 9, wherein the choke element comprises a cage having a plurality of openings therein and a plug, the plug being moveable longitudinally with respect to the cage.~~

~~11. The choke assembly according to either of claims 9 or 10, wherein the choke element is arranged to induce a rotational flow pattern in fluid passing through the choke element.~~

~~12. The choke assembly according to any of claims 9 to 11, wherein the separation chamber extends within the choke element.~~

~~13. The choke assembly according to claim 12, wherein the choke element is actuated by a stem, the first outlet comprising a bore extending through the stem.~~

~~14. The choke assembly according to any of claims 9 to 13, further comprising means for subjecting fluid leaving through the first outlet to further separation.~~

~~15. The choke assembly according to claim 14, wherein the said means comprises a separation chamber.~~

~~16. The choke assembly according to any of claims 9 to 15, further comprising means to inhibit or prevent the formation of a vortex in the separation chamber in the region adjacent the second outlet.~~

~~17. The choke assembly according to any of claims 9 to 16, wherein the separation chamber has an increasing cross-sectional area in the direction of flow towards the second outlet.~~

~~18. The choke assembly according to any of claims 9 to 16, further comprising a third outlet in the separation chamber.~~

~~19. The choke assembly according to claim 18, further comprising a conduit extending from the third outlet into the separation chamber.~~

~~20. The choke assembly according to claim 19, wherein the conduit extends longitudinally within the separation chamber.~~

~~21. The choke assembly according to claim 20, wherein the conduit comprises a plurality of tangential openings extending radially through the conduit.~~

~~22. A choke assembly comprising:~~

~~a choke element comprising a moveable choke component;~~

~~a stem connected to the moveable choke component;~~

~~wherein the stem has a bore therethrough to provide an outlet for fluid from within the choke element.~~

~~23. A method for controlling and separating a multiphase fluid stream, the method comprising:~~

~~passing the fluid stream through a choke element and controlling the flow of fluid using the choke element;~~

~~introducing the fluid stream into a separation zone and causing phases of the fluid stream to separate;~~

~~removing a lighter fluid phase from the separation zone through a first outlet; and~~

~~removing a heavier fluid phase from the separation zone through a second outlet.~~

~~24. The method according to claim 23, wherein the fluid flows in a rotational flow pattern in the separation zone, preferably a helical flow pattern.~~

~~25. The method according to either of claims 23 or 24, wherein the separation zone extends into the choke element.~~

~~26. The method according any of claims 23 to 25, wherein the first outlet extends through an actuation stem for the choke element.~~

~~27. The method according to any of claims 23 to 26, further comprising separating the heavier fluid phase after removal of the lighter fluid phase in the separation zone, a first heavier fluid phase being removed through the second outlet and a second heavier fluid phase being removed through a third outlet.~~

~~28. The method according to claim 27, wherein the heavier fluid phases are separated using a rotational flow pattern, preferably a helical flow pattern.~~

~~29. The method according to claim 28, wherein the second heavier fluid phase is removed from an axially central region of the separation chamber.~~

30. A method for controlling and separating a multiphase fluid stream, the method comprising:

passing the fluid stream through a choke element and controlling the flow of fluid using the choke element;

introducing the fluid stream into a separation zone and causing phases of the fluid stream to separate; and

removing a lighter fluid phase from the separation zone through an actuation stem extending from the choke element.

31. A choke assembly comprising a choke element comprising:

a cage having a plurality of openings therethrough for the passage of fluid;

a plug moveable with respect to the cage to open and close the openings in the cage;

wherein the openings in the cage extend tangentially to the cage, each opening comprising an outer portion extending from the outer surface of the cage having a first cross-sectional area and an inner portion extending from the inner surface of the cage having a second cross-sectional area, the first cross-sectional area being greater than the second cross-sectional area.

32. The choke assembly according to claim 31, wherein the change in the cross-sectional area of the opening is gradual or continuous through the cage.

33. The choke assembly according to claim 32, wherein at least a portion of the opening is curved and/or tapered.

34. The choke assembly according to claim 33, wherein the taper is asymmetrical, being offset in the reverse direction of flow of fluid around the exterior of the cage.

35. The choke assembly according to any of claims 31 to 34, wherein the cage comprises an inner cage element and an outer cage element arranged concentrically around the inner cage element.

36. The choke assembly according to claim 35, wherein the portion of the opening extending through the outer cage element reduces in cross-sectional area in the inward direction and the portion of the opening extending through the inner cage element has a constant cross-sectional area.

~~37. The choke assembly according to any of claims 31 to 36, wherein the ratio of the cross-sectional area of the opening at its inner end to the cross-sectional area of the opening at its outer end is from 1 : 1.5 to 1 :5.~~

~~38. A choke assembly comprising a choke element comprising:~~

~~a cage having a plurality of openings therethrough for the passage of fluid;~~

~~a plug moveable with respect to the cage to open and close the openings in the cage;~~

~~wherein the openings in the cage extend tangentially to the cage, the cage comprising openings arranged in a plurality of bands extending circumferentially around the cage, the cross-sectional area of the openings of the bands increasing in the upstream direction of the cage.~~

~~39. The choke assembly according to claim 38, wherein all the openings have the same cross-sectional area, the increase in cross-sectional area from band to band provided by an increasing number of openings.~~

~~40. The choke assembly according to either of claims 38 or 39, wherein the bands of openings are in groups, each group comprising a plurality of bands with the bands in each group all having the same number of openings.~~

~~41. The choke assembly according to claim 40, wherein each group comprises two bands of openings.~~

~~42. The choke assembly according to any of claims 38 to 41, wherein the openings in a given band are offset circumferentially from the openings in an adjacent band.~~

~~43. The choke assembly according to any of claims 38 to 41, wherein the plug is disposed within the cage.~~

~~44. A method of controlling the flow of a fluid, the method comprising:~~

~~introducing the fluid into a flow control zone having a general downstream direction in which the fluid is required to flow, the fluid being introduced into the flow control zone through a plurality of openings; wherein~~

~~fluid introduced through a first group of openings, downstream of a second group of openings, establishes a generally toroidal flow pattern within the flow control~~

~~zone, whereby the effective cross-sectional area available for the flow of fluid introduced through the second group of openings in the downstream direction is reduced.~~

~~45. The method according to claim 44, wherein the first group comprises a plurality of openings.~~

~~46. The method according to either of claims 44 or 45, wherein fluid introduced through the second group of openings is caused to form a second generally toroidal flow pattern disposed upstream of the first group of openings.~~

~~47. The method according to claim 46, further comprising introducing fluid through a third group of openings to form a third generally toroidal flow pattern upstream of the second.~~

~~48. A choke installation comprising two or more of:~~
~~a choke assembly as claimed in any of claims 9 to 22; and~~
~~a choke assembly as claimed in any of claims 31 to 43.~~