CLAIMS

1. An apparatus for controlling the flow of a first fluid stream within a bulk rotating fluid stream, the apparatus comprising:

a fluid flow region having a longitudinal axis, within which a rotating flow of fluid may be established;

a flow guide having a convex outer surface disposed centrally within the fluid flow region, the convex outer surface of the flow guide extending ~~parallel to the longitudinal axis of~~downstream within the fluid flow region, the convex surface being shaped to induce a spiral coanda effect in the flow of the first fluid stream over the flow guide and to direct the first fluid stream into an outlet.

2. The apparatus according to claim 1, the apparatus comprising:

a vessel comprising a separation region;

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

means for imparting ~~a~~ the rotational flow to the fluid stream such that the fluid stream flows in a downstream helical path within the vessel;

a conduit extending within the vessel having an opening in the end portion thereof to provide ~~an~~ the outlet for a fluid fraction from the separation region of the vessel;

~~a~~ the flow guide being on the distal end of the conduit, the flow guide having a lateral dimension greater than that of the conduit and a convex outer surface to induce a spiral coanda effect in a flow of fluid over the flow guide, thereby directing the fluid into the opening in the conduit.

3. The apparatus according to ~~either of~~ claim~~s 1 or~~ 2, wherein the flow guide has a breakaway point adjacent or close to ~~a~~ the fluid outlet.

4. The apparatus according to either of claims 2 or 3, wherein the separation region of the vessel is cylindrical.

5. The apparatus according to any of claims 2 to 4, comprising a plurality of fluid inlets.

6. The apparatus according to any of claims 2 to 5, wherein the or each fluid inlet is rectangular in cross-section.

7. The apparatus according to any of claims 2 to 6, wherein the or each fluid inlet is oriented at an angle to the radial axis of the vessel.

8. The apparatus according to claim 7, wherein the or each fluid inlet is tangential to the radial axis of the vessel.

9. The apparatus according to any of claims 2 to 8, wherein the or each fluid inlet is oriented at an angle to the longitudinal axis of the vessel, such that fluid entering the vessel is directed downstream of the fluid inlet.

10. The apparatus according to claim 9, wherein the or each fluid inlet is oriented such that fluid entering the vessel is prevented from colliding with fluid present and rotating in the vessel.

11. The apparatus according to any of claims 2 to 10, further comprising one or more guides or guides surfaces to induce a rotational flow pattern in the fluid in the vessel.

12. The apparatus according to any of claims 2 to 11, wherein the conduit extends axially within the vessel.

13. The apparatus according to any of claims 2 to 12, wherein the conduit is disposed to remove a relatively lower density fluid from the separation region.

14. The apparatus according to claim 13, wherein the ~~lighter~~ relatively lower density fluid is caused to flow over the surface of the flow guide in an upstream direction towards the opening.

15. The apparatus according to claim 14, the apparatus comprising:

the conduit extending within the vessel and having ~~an~~ the opening forming the outlet in the end portion thereof to provide ~~an~~ the outlet for ~~a lighter~~the relatively lower density fluid fraction from a central region of the separation region of the vessel; ~~and~~

~~a~~wherein the flow guide is on the distal end of the conduit and disposed downstream of the opening in the end portion of the conduit, the flow guide having ~~a convex surface and~~ a lateral dimension greater than that of the conduit and an outer surface to induce a spiral coanda effect in a flow of lighter fluid over the flow guide, thereby directing the lighter fluid into the opening in the conduit.

16. The apparatus according to any of claims 13 to 15, wherein the conduit extends into the separation region from the upstream end of the vessel.

17. The apparatus according to any of claims 2 to 12, wherein the conduit is disposed to remove a relatively higher density fluid from the separation region.

18. The apparatus according to claim 17, wherein the ~~heavier~~ relatively higher density fluid is caused to flow over the surface of the flow guide in a downstream direction towards the opening.

19. The apparatus according to claim 18, apparatus comprising:

the conduit extending within the vessel and having ~~an~~ the opening in the end portion thereof to provide ~~an~~ the outlet for ~~a heavier~~the relatively higher density fluid ~~fraction~~ from a central region of the separation region of the vessel; ~~and~~

~~a~~wherein the flow guide is on the distal end of the conduit and disposed upstream of the opening in the end portion of the conduit, the flow guide having ~~a convex surface and~~ a lateral dimension greater than that of the conduit and an outer surface to induce a spiral coanda effect in a flow of ~~heavier~~ the relatively higher density fluid over the flow guide, thereby directing the ~~heavier~~ relatively higher density fluid into the opening in the conduit.

20. The apparatus according to any of claims 17 to 19, wherein the conduit extends into the separation region from the downstream end of the vessel.

21. The apparatus according to any of claims 2 to 20, wherein the opening in the conduit faces radially outwards.

22. The apparatus according to claim 21, wherein the opening in the conduit is arranged to extend tangentially to the direction of rotation of the flow of fluid within the vessel.

23. The apparatus according to either of claims 21 or 22, wherein the opening is provided in a portion of the wall of the conduit extending parallel to the longitudinal axis of the vessel.

24. The apparatus according to any of claims 2 to 23, wherein the opening in the conduit comprises a plurality of apertures.

25. The apparatus according to any of claims 2 to 24, wherein the opening is disposed at a position displaced from the distal end of the conduit.

26. The apparatus according to any of claims 2 to 25, wherein the flow guide has a continuous curved surface that is presented to the flow of fluid passing thereover.

27. The apparatus according to claim 26, wherein the flow guide is bulb-shaped or dome-shaped.

28. The apparatus according to any of claims 2 to 27, the apparatus comprising:

a first conduit extending in downstream direction within the separation region in the vessel and provided with ~~and~~ the opening forming the outlet and a first flow guide at its distal end, for the removal of a ~~lighter~~ relatively lower density fluid ~~fraction~~; and

a second conduit extending within separation region in the vessel in an upstream direction, the second conduit being provided with an opening through which a ~~heavier~~ relatively higher density fluid ~~fraction~~ is removed from the separation region and a second flow guide at its distal end.

~~29. The apparatus according to any of claims 2 to 28, wherein the conduit is for removing a heavier fluid fraction in a downstream direction, the flow guide comprising one or more ports or channels therethrough for the passage of lighter fluid from the region downstream of the flow guide to the region upstream of the flow guide.~~

~~30. A method for controlling the flow of a first fluid stream within a bulk rotating fluid stream, the method comprising:~~

~~providing a bulk fluid stream and imparting a rotational flow pattern to the bulk fluid to induce a first fluid fraction to form in the innermost region of the flow pattern;~~

~~causing the first fluid fraction to flow as the first fluid stream over the convex surface of a flow guide to induce a spiral coanda effect, thereby allowing the direction and orientation of the flow of the first fluid stream to be controlled.~~

~~31. The method of claim 30, for separating a multiphase fluid stream, the fluid stream comprising a relatively high density component and a relatively low density component, the method comprising:~~

~~introducing the multiphase fluid into a separation zone;~~

~~imparting a rotational movement into the fluid, whereby a lighter fluid fraction is caused to collect in the radially central region of the separation zone and a heavier fluid faction is caused to collect in the radially outer region of the separation zone;~~

~~inducing a spiral coanda flow in a fluid fraction to direct the fluid fraction towards a fluid outlet disposed and thereby removing the fluid fraction from the separation zone.~~

~~32. The method according to either of claims 30 or 31, wherein the fluid stream comprises one or more liquid phases, a liquid and a gas phase, or a combination thereof.~~

~~33. The method according to any of claims 30 to 32, wherein the fluid stream is produced from a subterranean oil or gas well.~~

~~34. The method according to any of claims 30 to 33, the method comprising:~~

~~providing an outlet for low density fluid in a central region of the separation zone;~~

providing a flow guide downstream of the outlet, the flow guide inducing a spiral coanda flow of low density fluid in the upstream direction and directing the low density fluid inwards towards the outlet.

35. The method according to any of claims 30 to 34, the method comprising:

providing an outlet for high density fluid in the separation zone;

providing a flow guide upstream of the outlet, the flow guide inducing a spiral coanda flow of high density fluid in the downstream direction and directing the high density fluid towards the outlet.

3629. A wellhead installation comprising an apparatus according to any of claims 1 to 2928.

3730. The wellhead installation according to claim 3629, wherein the apparatus is located subsea.

38. A method of producing a fluid stream from a subterranean oil or gas well, comprising the method according to claims 30 to 35.