CLAIMS

1. A method of severing a drill pipe string, the method including:

dropping or pumping a flow-actuated cutter into a drill pipe string provided with a fluid bypass device;

activating the fluid bypass device to facilitate fluid circulation through the string; landing the cutter at a predetermined location in the string; and

pumping fluid down through the drill string and through the cutter to actuate the cutter and remove material from a selected portion of the drill string.

2. The method of claim 1, comprising applying torque or tension to the string.

3. The method of claim 1 or 2, wherein, once the drill string has been severed, delivering cement through the string to form a kick-off plug.

4. The method of claim 1, 2 or 3, wherein the selected portion is the neck of a drill pipe connection and wherein removing material comprises reducing the loadbearing cross-sectional area of the neck by forming a circumferential cut.

5. The method of claim 4, wherein the cut is circumferentially continuous.

6. The method of claim 4, wherein the cut is circumferentially discontinuous.

7. The method of any of claims 1 to 6, wherein the flow-actuated cutter is a fluid cutter and utilises fluid pumped from surface as a cutting fluid.

8. The method of any of claims 1 to 7, comprising directing fluid from the cutter in a high velocity stream towards an inner surface of the string.

9. The method of any of claims 1 to 8, comprising locating a fluid outlet from the cutter directly adjacent an inner surface of the drill string.

10. The method of any of claims 1 to 9, comprising directing fluid from the cutter at a transverse angle to the string axis.

11. The method of any of claims 1 to 10, comprising directing fluid from the cutter at an incline relative to the string axis.

12. The method of any of claims 1 to 11, comprising creating eddies or vortices in the fluid exiting the cutter.

13. The method of any of claims 1 to 12, comprising directing fluid from the cutter in a continuous circumferential stream.

14. The method of any of claims 1 to 13, comprising directing fluid from the cutter in discrete jets.

15. The method of any of claims 1 to 14, comprising rotating a fluid outlet around the axis of the string.

16. The method of any of claims 1 to 15, comprising sealing a body of the cutter to a wall of the string and directing all of the fluid pumped down the string into the cutter.

17. The method of any of claims 1 to 16, comprising adding an abrasive material to cutting fluid directed from the cutter to increase the cutting effect.

18. The method of any of claims 1 to 17, comprising filtering the cutting fluid to avoid larger particles reaching the cutter.

19. The method of any of claims 1 to 18, comprising mechanically cutting the drill string.

20. The method of claim 19, comprising rotating a cutting member.

21. The method of claim 19 or 20, comprising radially extending a cutting member.

22. The method of any of claims 1 to 21, comprising driving a cutting member using a mud motor or turbine.

23. The method of any of claims 1 to 22, comprising landing the cutter in a cutter seat.

24. The method of any of claims 1 to 23, comprising:

pumping the fluid from surface down through an internal bore defined by the drill string and through the cutter to actuate the cutter and remove material from the selected portion of a wall of the drill string;

directing the fluid from the drill string bore and through the open fluid bypass device into an annulus between the drill string and a surrounding bore wall, and

returning the fluid to surface.

25. The method of any of claims 1 to 24, comprising activating the fluid bypass device to bypass fluid pressure loss-inducing drill string elements below the bypass device.

26. The method of any of claims 1 to 24, comprising activating the fluid bypass device to bypass a packed-off section of annulus between the drill string and a surrounding bore wall.

27. The method of any of claims 25 to 26, comprising activating a fluid bypass device before activating the cutter.

28. The method of any of claims 1 to 27, comprising activating a further fluid bypass device after the drill string has been severed and then pumping cement through the string and through the open bypass device to form a kick-off plug.

29. The method of any of claims 1 to 28, comprising retrieving the cutter with the string, or reconfiguring the cutter to disengage from the string, following severing of the drill string.

30. The method of any of claims 1 to 29, comprising reconfiguring the cutter to allow the cutter to drop out of the severed string or open a less restricted flow path through the string.

31. The method of any of claims 1 to 30, wherein the fluid is drilling mud.

32. Apparatus for severing a drill pipe string, the apparatus comprising a flow-actuated cutter configured to be dropped or pumped into a drill pipe string and to land at a predetermined location in the string, and a fluid bypass device for location in the string to facilitate fluid circulation in the string, whereby circulating fluid down through the drill string actuates the cutter to remove material from a selected portion of the drill string.

33. The apparatus of claim 32, wherein the cutter is configured such that the fluid exits the cutter in a high velocity stream directed towards an inner surface of the string.

34. The apparatus of claim 33, wherein the cutter defines a flow passage and the flow passage defines a constriction or nozzle to provide the high velocity outlet stream.

35. The apparatus of claim 34, wherein portions of the flow passage are formed of an erosion resistant material.

36. The apparatus of claim 35, wherein portions of the flow passage are coated with a hard facing material.

37. The apparatus of any of claims 33 to 36, wherein a fluid outlet is configured to be directly adjacent an inner surface of the drill string.

38. The apparatus of any of claims 32 to 37, wherein the cutter is configured such that fluid exits the cutter at a transverse angle to the string axis.

39. The apparatus of any of claims 32 to 38, wherein the cutter is configured such that the fluid exits the cutter in a continuous circumferential stream.

40. The apparatus of claims 32 to 38, wherein the cutter is configured such that the fluid exits the cutter in discrete jets.

41. The apparatus of any of claims 32 to 40, wherein a cutter fluid outlet is rotatable around the axis of the string.

42. The apparatus of any of claims 32 to 41, in combination with a seal bore provided in the string and wherein an external seal is provided on a cutter body between a flow passage inlet and a flow passage outlet for cooperation with the seal bore such that all of the fluid pumped down the string is directed into the cutter.

43. The apparatus of any of claims 32 to 42, including a filter in a fluid circulation path to avoid larger particles reaching the cutter and potentially blocking the cutter.

44. The apparatus of any of claims 32 to 43, wherein the cutter includes a mechanical cutting member.

45. The apparatus of claim 44, including a mud motor or turbine for driving the cutting member.

46. The apparatus of any of claims 32 to 45, in combination with a seat provided in the drill string and including a cutter locator including a profile dimensioned to engage the seat.

47. The apparatus of claim 46, wherein the seat is provided by a catcher ring.

48. The apparatus of claim 47, wherein the ring includes external seals.

49. The apparatus of claim 47 or 48, wherein the ring is adapted for location in an upper part of a locating sub.

50. The apparatus of any of claims 32 to 49, wherein a plurality of seats is provided for cooperation with a respective cutter locator, and wherein the seats are of progressively smaller diameters.

51. The apparatus of any of claims 46 to 50, wherein a cutter locator and a seat are configured to engage and form a seal therebetween.

52. The apparatus of any of claims 46 to 51, wherein the seat is configured for location in a conventional drill string element.

53. The apparatus of any of claims 46 to 51, wherein the seat is configured for location in a cutter locating sub.

54. The apparatus of any of claims 32 to 53, wherein the bypass device is adapted for location below the intended severing location.

55. The apparatus of any of claims 32 to 53, wherein the bypass device is adapted for location above the intended severing location.

56. The apparatus of any of claims 32 to 55, wherein a plurality of bypass devices are provided for location in the drill string, each to be associated with a particular severing location.

57. The apparatus according to any of claims 32 to 56, wherein the cutter is configured to be retrieved together with the string, or wherein the cutter is configured to disengage from the string, following severing of the drill string.

58. The apparatus of any of claims 32 to 57, wherein the cutter is reconfigurable to allow the cutter to drop out of the severed string or open a less restricted flow path through the string.

59. A method of severing a drill string, the method comprising:

opening a bypass valve in a stuck string;

locating a flow-actuated cutter in the drill string; and

circulating fluid through the drill string to actuate the cutter and remove material from a selected portion of the drill string.

60. The method of claim 59 comprising:

pumping the fluid from surface down through an internal bore defined by the drill string and through the cutter to actuate the cutter and remove material from the selected portion of a wall of the drill string;

directing the fluid from the drill string bore and through the open bypass valve into an annulus between the drill string and a surrounding bore wall, and returning the fluid to surface.

61. The method of claim 59 or 60, comprising activating the fluid bypass valve to bypass fluid pressure loss-inducing drill string elements below the bypass valve.

62. The method of claim 59 or 60, comprising activating the fluid bypass valve to bypass a packed-off section of annulus between the drill string and a surrounding bore wall.

63. The method of any of claims 59 to 62, wherein the drill string is severed into an upper portion and a lower portion.

64. The method of claim 63, wherein once the pipe string has been severed, delivering cement into the bore through the upper portion of the string to form a kick-off plug above the lower portion of the string that remains in the bore.

65. The method of claim 63 or 64, wherein once the pipe string has been severed, removing the lower portion of the string from the bore.

66. The method of any of claims 63 to 65, comprising removing one of more devices from the lower portion of the string.

67. The method of any of claims 63 to 65, comprising removing the upper portion of the string from the bore and running a further string run into the bore to engage or mate with the top of the lower section of the string that remains in the hole.

68. The method of any of claims 63 to 67, comprising passing wireline equipped with a fishing tool through the further string and into the lower section of the tool.

69. Apparatus for severing a drill string, the apparatus comprising:

a bypass valve configured for location in a drill string; and

a flow-actuated cutter configured to be run into the drill string and positioned above the bypass valve, whereby, in use, the bypass valve is opened and fluid circulated through the drill string to actuate the cutter and remove material from a selected portion of the drill string.