Claims

1. A subsea torque tool (10) comprising a tool housing;
at least one torque drive head (13);
a drive mechanism (16) operable to rotate the at least one torque drive head (13);
wherein the drive mechanism (16) comprises a first motor (17) having a first torque output characterised in that said drive mechanism further comprises a second motor (18) having a second torque output, and is operable to rotate the first and second motors (17, 18) in the same direction; and
wherein the first and second motors (17, 18) are operable to drive a common drive shaft (15).

2. The subsea torque tool (10) according to claim 1 wherein the first and second (17, 18) motors are gerotors.

3. The subsea torque tool (10) according to claim 1 or claim 2 wherein the first torque output and the second torque output have different torque values.

4. The subsea torque tool (10) according to any preceding claim wherein the drive mechanism (16) is configured to operate the first and second motors (17, 18) in the same direction in one mode of operation, and configured to operate the first and second motors (17, 18) in opposing directions in a second mode of operation.

5. The subsea torque tool (10) according to any preceding claim wherein the drive mechanism (16) is configured to selectively operate only the first motor (17); only the second motor (18); or operate both motors (17, 18) simultaneously.

6. The subsea torque tool (10) according to any preceding claim, wherein the drive mechanism (16) is configured to operate in a high torque mode, in which the first and second motors (17, 18) are operated concurrently in the same direction to generate a high torque output.

7. The subsea torque tool (10) according to any preceding claim, wherein the drive mechanism (16) is configured to operate in a super low torque mode, in which the first and second motors (17, 18) are operated concurrently at the same time in opposing directions to generate a super low torque output.

8. The subsea torque tool (10) according to any preceding claim wherein the first and second motors (17, 18) are hydraulic motors and the drive mechanism (16) comprises a hydraulic motor interface device (20) comprising a first interface surface on one side of the device configured to couple a hydraulic fluid supply to the first motor (17), and a second interface surface on an opposing side of the device configured to couple a hydraulic fluid supply to the second motor (18), and wherein the first and/or second interface surface comprises one or more grooves (63, 64, 65, 66) to fluidly couple with the first and/or second motors (17, 18).

9. The subsea torque tool (10) according to claim 8 wherein the hydraulic motor interface device (20) comprises a plurality of radial ports (62, 81, 82, 83, 84) fluidly connected with the one or more grooves to fluidly couple with the first and/or second motors (17, 18).

10. The subsea torque tool (10) according to claim 8 or claim 9 wherein the drive mechanism (16) comprises a transfer plate (42, 52) located between the hydraulic motor interface device (20) and each motor (17, 18), configured to control the flow of hydraulic fluid into and out from the motors (17, 18).

11. The subsea torque tool (10) according to any of claims 8 to 10 wherein the common drive shaft (15) extends through the hydraulic motor interface device (20) and through the transfer plates (42, 52).

12. The subsea torque tool (10) according to any of claims 8 to 11 comprising a drainage path for at least one of the first or second hydraulic motors (17, 18), wherein the drainage path is configured to enable hydraulic fluid from a disengaged hydraulic motor to be drained when the other of the hydraulic motors is operable.

13. The subsea torque tool (10) according to any of claims 8 to 12 wherein the hydraulic motor interface device (20) comprises a drain port (85), and wherein the first and/or second interface surfaces on the hydraulic motor interface device (20) comprise one or more drainage grooves or channels (67, 68) which may be in fluid communication with the drain port (85).

14. The subsea torque tool (10) according to any of claims 8 to 13 wherein the torque tool (10) comprises a pilot relief manifold block (100) which controls the drainage of hydraulic fluid from a disengaged motor to a hydraulic return line.

15. The subsea torque tool (10) according to any of claims 8 to 14 wherein the hydraulic motor interface device (20) has an axial dimension in the direction of the drive shaft (15) of less than approximately 40mm.

16. A method of operating a subsea torque tool (10) comprising:
providing a subsea torque tool (10), the subsea torque tool (10) comprising at least one torque drive head (13) and a drive mechanism (16) operable to rotate the at least one torque drive head (13); and a first motor (17) having a first torque output and a second motor (18) having a second torque output, wherein the first and second motors (17, 18) are operable to be rotated in the same direction;
operating the first and/or second motors (17, 18) to drive a common drive shaft.

17. The method according to claim 16, comprising:
operating the drive mechanism (16) in a high torque mode, in which the first and second motors (17, 18) are operated concurrently in the same direction to generate a high torque output; or
operating the drive mechanism (16) in a super low torque mode, in which the first and second motors (17, 18) are operated concurrently at the same time in opposing directions to generate a super low torque output.

18. The method according to claim 16 or claim 17 , wherein the first and second motors (17, 18) are hydraulic motors, and the method comprises draining the hydraulic fluid from a de-activated hydraulic motor when the other hydraulic motor is activated.

19. A subsea vehicle system comprising the subsea torque tool (10) according to any of claims 1 to 15.