CLAIMS

1. A **trigger valve**, comprising or including,

   A housing enclosing, at least in part, a cavity,

   A trigger poppet including a poppet sealing portion at least in part within the cavity, the trigger poppet configured to receive an external input at, or toward, a receiving end thereof,

   A trigger piston including a primary sealing portion and a major face at least in part within the cavity, the trigger piston configured to receive high pressure fluid therethrough, the trigger piston having a minor face opposite the major surface and a secondary sealing portion,

   Wherein the trigger poppet and trigger piston are biased towards each other at least by the high-pressure fluid acting on the minor face, such that the high-pressure fluid is sealed from the cavity by the poppet sealing portion and primary sealing portion in sealing engagement on each other;

   The secondary sealing portion sealing against the housing, or part thereof, preventing release of the high-pressure fluid therefrom, and

   the poppet sealing portion when displaced from the primary sealing portion by the external input unseals the sealing engagement and allows high pressure fluid to flow into the cavity and act on the major face causing the trigger poppet to move and unseats the secondary sealing portion from the housing, or part thereof, to allow flow of high pressure fluid to then do work, or cause work to be done.

2. A trigger valve as claimed in claim 1 wherein the work is in the form of the high-pressure fluid acting on a first external device, such as, but not limited to another surface, valve, dose valve, or similar.

3. A trigger valve as claimed in claim 1 or 2 wherein the trigger piston has a second end, opposite and distal from a first end that has the primary sealing portion, that can act on the first external, or a second external device.

4. A trigger valve as claimed in claim 3 the second end can act as a hammer to impact on the first, or second, external device.

5. A trigger valve as claimed in any one of claims 1 to 4 wherein the trigger piston moves in a first direction within the cavity.

6. A trigger valve as claimed in any one of claims 1 to 4 wherein the trigger poppet moves in a second direction within the cavity.

7. A trigger valve as claimed in claims 5 and 6 wherein the first direction and second direction are parallel to each other.

8. A trigger valve as claimed in any one of claims 1 to 7 wherein the major face and minor face are each perpendicular to the first direction.

9. A trigger valve as claimed in any one of claims 1 to 8 wherein the receiving end is distal from the primary sealing portion.

10. A trigger valve as claimed in any one of claims 1 to 9 wherein the trigger poppet is surrounded by, and the cavity filled by, ambient pressure, which may be atmospheric, environmental or another reference pressure when in sealing engagement.

11. A trigger valve as claimed in any one of claims 1 to 10 wherein the trigger piston and, or the trigger poppet, are further biased toward the sealing engagement by one or more biasing elements, such as, but not limited to a spring, or other elastic element, whether in tension or compression.

12. A trigger valve as claimed in any one of claims 1 to 11 wherein the cavity includes one or more leak paths from an interior thereof to an exterior thereof, such as, but not limited to bleed ports, or less than perfect sealing about the trigger poppet, trigger piston, or parts thereof.

13. A trigger valve as claimed in any one of claims 1 to 12 wherein the primary sealing portion is an endless knife edge and the poppet sealing portion seals thereto, either or both being a resilient material to at least in part conform and seal to the other, or vice versa.

14. A trigger valve as claimed in any one of claims 1 to 13 wherein there is a pilot port through the trigger piston to within a sealing periphery formed between the primary sealing portion and poppet sealing portion.

15. A trigger valve as claimed in any one of claims 1 to 14 wherein a sealing area contained within the sealing periphery creates a first force from the high-pressure fluid, that is less than a second force created by the bias acting on the trigger poppet, such that the sealing engagement is maintained.

16. A trigger valve as claimed in any one of claims 1 to 15 wherein there is a third force from the high-pressure fluid acting on the minor face including with any further bias, when in sealing engagement.

17. A trigger valve as claimed in any one of claims 1 to 16 wherein the second force and third force drive the two portions together to form the sealing engagement.

18. A trigger valve as claimed in any one of claims 1 to 17 wherein the high-pressure fluid creates a fourth force when acting on the major face that is greater than the third force including any further bias.

19. A trigger valve as claimed in any one of claims 1 to 18 wherein the high-pressure fluid is fed from a high-pressure fluid volume.

20. A trigger valve as claimed in any one of claims 1 to 19 wherein the high-pressure fluid volume is supplied from a high-pressure fluid source, either constantly, or selectively.

21. A trigger valve as claimed in any one of claims 1 to 20 wherein the selective supply is closed, or closes, when the sealing engagement is unsealed, and, or when the secondary sealing portion is unseated.

22. A trigger valve as claimed in any one of claims 1 to 21 wherein, the constant supply from the high-pressure fluid source is at a first flow rate that is lower than a second flow rate when the sealing engagement is unsealed and, or the secondary sealing portion is unseated.

23. A trigger valve as claimed in any one of claims 1 to 22 wherein the high-pressure fluid is in the range of 10 to 50 bar, and ideally at around 16 bar.

24. A trigger valve as claimed in any one of claims 1 to 23 wherein the interior of the cavity can exhaust high pressure fluid back through the pilot port into the high-pressure volume when unsealed.

25. A trigger valve as claimed in any one of claims 1 to 24 wherein the high pressure fluid pressure acting on the major face will reduce after unsealing, as the high pressure fluid does work when the secondary sealing portion is unseated, such that the fourth force reduces to below the third force, allowing the trigger piston to be biased back towards sealing engagement.

26. A trigger valve as claimed in any one of claims 1 to 25 wherein unseating of the secondary sealing portion allows the high-pressure fluid to vent to ambient.

27. A trigger valve as claimed in any one of claims 1 to 26 wherein the trigger poppet is driven in the second direction, opposite to the first direction, when unsealed, by the high-pressure fluid, acting on the poppet sealing portion.

28. A trigger valve as claimed in any one of claims 1 to 27 wherein the trigger poppet has at least a first partial seal where any part of it extends beyond the cavity.

29. A trigger valve as claimed in any one of claims 1 to 28 wherein the trigger piston has at least a second partial seal between a periphery thereof and the interior of the cavity.

30. A **trigger valve**, comprising or including,
A valve body, with an interior thereof defining a cavity,
A trigger poppet, at least in part located within the cavity,
A trigger piston, at least in part located within the cavity,
The trigger poppet and the trigger piston having,
first positions where they are biased to be in sealing engagement with each other, such that a supply of high-pressure fluid is prevented from entering between them, and
second positions where receipt of an external input unseals the sealing engagement, the high-pressure fluid can enter between them, forcing them apart, such that a flow of high pressure fluid is released to then do work, or cause work to be done, on an external device.

31. A **trigger valve** that operates on a high-pressure fluid, comprising or including,

A valve housing, the valve body defining a pressure cavity,

A primary trigger poppet that can receive an external input, and having a first poppet sealing surface or portion located within the pressure cavity,

A secondary trigger piston that can act on an external device, and having a primary sealing surface or portion, the secondary trigger piston can receive a source of the high pressure fluid, which high pressure fluid is sealed at a sealing engagement of the first poppet sealing surface, and primary sealing surface,

the primary trigger poppet and secondary trigger piston biased towards sealing engagement at the first poppet sealing surface, and primary sealing surface,

upon receipt of the external input the first poppet sealing surface is displaced from the sealing engagement, and the high-pressure fluid can flow into an interior of the pressure cavity to then displace the secondary trigger piston to then act, or cause an action, on the external device.

32. A **method of operation of a trigger valve**, comprising or including the steps of,

Providing a housing having a cavity therein, at least in part within which there is a trigger poppet, and a trigger piston,

Biasing the trigger poppet and the trigger piston at least in part by a high pressure fluid such that in a first position they are in sealing engagement with each other so that the high pressure fluid is prevented from moving between them, and wherein a flow of high pressure fluid is prevented from exiting the housing, or part thereof,

Disturbing the trigger poppet, and or the trigger piston by an external input such that the they move to a second position where high pressure fluid can flow therebetween and drive them apart,

allowing the flow of high-pressure fluid, when the trigger poppet and or the trigger piston move to or toward the second position, to exit the housing, or part thereof,

working on an external device by the flow of high pressure exiting the housing, or part thereof,

exhausting the high-pressure fluid between the trigger poppet and trigger piston such that the trigger poppet and, or trigger piston can return, under the, or another bias, to the first position,

such that the trigger valve allows or causes an instance of work to be done by the high-pressure fluid on an external device, in response to an external input, and thereafter reset itself in preparation for a further external input.

33. A method as claimed in claim 32 wherein the work is in the form of the high-pressure fluid acting on a first external device, such as, but not limited to another surface, valve, dose valve, or similar.

34. A method as claimed in claim 31 or 32 wherein the trigger piston has a second end, opposite and distal from a first end that has the primary sealing portion, that can act on the first external, or a second external device.

35. A method as claimed in claim 34 the second end can act as a hammer to impact on the first, or second, external device.

36. A method as claimed in any one of claims 32 to 35 wherein the trigger piston moves in a first direction within the cavity.

37. A method as claimed in any one of claims 32 to 36 wherein the trigger poppet moves in a second direction within the cavity.

38. A method as claimed in claims 36 and 37 wherein the first direction and second direction are parallel to each other.

39. A method as claimed in any one of claims 32 to 38 wherein the major face and minor face are each perpendicular to the first direction.

40. A method as claimed in any one of claims 32 to 39 wherein the receiving end is distal from the primary sealing portion.

41. A method as claimed in any one of claims 32 to 40 wherein the trigger poppet is surrounded by, and the cavity filled by, ambient pressure, which may be atmospheric, environmental or another reference pressure when in sealing engagement.

42. A method as claimed in any one of claims 32 to 41 wherein the trigger piston and,

or the trigger poppet, are further biased toward the sealing engagement by one or more biasing elements, such as, but not limited to a spring, or other elastic element, whether in tension or compression.

43. A method as claimed in any one of claims 32 to 42 wherein the cavity includes one or more leak paths from an interior thereof to an exterior thereof, such as, but not limited to bleed ports, or less than perfect sealing about the trigger poppet, trigger piston, or parts thereof.

44. A method as claimed in any one of claims 32 to 43 wherein the primary sealing portion is an endless knife edge and the poppet sealing portion seals thereto, either or both being a resilient material to at least in part conform and seal to the other, or vice versa.

45. A method as claimed in any one of claims 32 to 44 wherein there is a pilot port through the trigger piston to within a sealing periphery formed between the primary sealing portion and poppet sealing portion.

46. A method as claimed in any one of claims 32 to 45 wherein a sealing area contained within the sealing periphery creates a first force from the high-pressure fluid, that is less than a second force created by the bias acting on the trigger poppet, such that the sealing engagement is maintained.

47. A method as claimed in any one of claims 32 to 46 wherein there is a third force from the high-pressure fluid acting on the minor face including with any further bias, when in sealing engagement.

48. A method as claimed in any one of claims 32 to 47 wherein the second force and third force drive the two portions together to form the sealing engagement.

49. A method as claimed in any one of claims 32 to 48 wherein the high-pressure fluid creates a fourth force when acting on the major face that is greater than the third force including any further bias.

50. A method as claimed in any one of claims 32 to 49 wherein the high-pressure fluid is fed from a high-pressure fluid volume.

51. A method as claimed in any one of claims 32 to 50 wherein erably the high-pressure fluid volume is supplied from a high-pressure fluid source, either constantly, or selectively.

52. A method as claimed in any one of claims 32 to 51 wherein the selective supply is closed, or closes, when the sealing engagement is unsealed, and, or when the secondary sealing portion is unseated.

53. A method as claimed in any one of claims 32 to 52 wherein, the constant supply from the high-pressure fluid source is at a first flow rate that is lower than a second flow rate when the sealing engagement is unsealed and, or the secondary sealing portion is unseated.

54. A method as claimed in any one of claims 32 to 53 the high-pressure fluid is in the range of 10 to 50 bar, and ideally at around 16 bar.

55. A method as claimed in any one of claims 32 to 54 wherein the interior of the cavity can exhaust high pressure fluid back through the pilot port into the high-pressure volume when unsealed.

56. A method as claimed in any one of claims 32 to 55 wherein the high pressure fluid pressure acting on the major face will reduce after unsealing, as the high pressure fluid does work when the secondary sealing portion is unseated, such that the fourth force reduces to below the third force, allowing the trigger piston to be biased back towards sealing engagement.

57. A method as claimed in any one of claims 32 to 56 wherein unseating of the secondary sealing portion allows the high-pressure fluid to vent to ambient.

58. A method as claimed in any one of claims 32 to 57 wherein the trigger poppet is driven in the second direction, opposite to the first direction, when unsealed, by the high-pressure fluid, acting on the poppet sealing portion.

59. A method as claimed in any one of claims 32 to 58 wherein the trigger poppet has at least a first partial seal where any part of it extends beyond the cavity.

60. A method as claimed in any one of claims 32 to 59 wherein the trigger piston has at least a second partial seal between a periphery thereof and the interior of the cavity.

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