that such documents, or such sources of information, in any jurisdiction, are prior art, or form part of the common general knowledge in the art.

It is an object of the present invention to provide an improved actuation and or valving system for high pressure fluids, or to provide improved actuation and or valving system for high pressure fluids that is more efficient and is largely or solely powered by high pressure fluid or gas, or to overcome the above shortcomings or address the above desiderata, or to at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

A first aspect the present invention provides a **device**, comprising or including,

a dump chamber that is annular in shape, to receive high pressure fluid from a high pressure fluid source,

a dose chamber, to receive a flow of the high pressure fluid from the dump chamber via a flow path from the dump chamber to the dose chamber, having an outlet,

a working chamber having an inlet end at an end thereof,

a dose valve member with an annular sealing surface surrounding the inlet end,

wherein with the dose valve member in a closed condition the sealing surface meets with an annular seat to seal the outlet; and with the dose valve member in an open condition a gap is presented between the annular sealing surface and the seat to allow high pressure fluid to move from the outlet to the inlet, and flow of high pressure fluid is prevented from entering the dose chamber or the dump chamber,

wherein the high pressure fluid in the dump chamber, at least in part, holds the dose valve member in the closed condition, until the high pressure fluid pressure in the dump chamber is reduced, whereby the high pressure fluid in the dose chamber unseats the dose valve member to the open position.

Preferably when the dose valve member is open flow of high pressure fluid is prevented from entering the dump chamber.

Preferably the flow path is in a skirt of the dose valve.

Preferably there is a restriction in the flow path from the dump chamber to the dose chamber, such that the dump chamber will add to the closing pressure of the dose valve even when filling the dose chamber.

Preferably there is a one way valve in the flow path from the dump chamber to the dose chamber.

Preferably the dump chamber is an hollow cylindrical volume, such as an annular chamber.

Preferably the pressure in the dump chamber is reduced by a trigger mechanism or similar.

Preferably the trigger mechanism dumps the pressure in the dump chamber to atmosphere.

Preferably the workload is returned to the inlet end by a fluid cushion on a back side thereof, or a spring on a back side or front side, or a tensile member connected from a front side to or towards the inlet end.

Preferably the bias on the exhaust valve is a spring.

Preferably wherein, or in addition the bias on the exhaust valve is a tensile member connected between the workload and the exhaust valve.

Preferably there is a safety valve to selectively dump pressure from the dose chamber to prevent operation of the device.

Preferably there is a slow leak safety valve that releases fluid pressure from the dose chamber should the high pressure fluid supply pressure drop below that of the dose chamber.

In another aspect the present invention consists in a **method of operating a high pressure fluid device**, comprising or including the steps of,

Filling a dump chamber that is annular in shape with a high pressure fluid,

Increasing a sealing pressure of a valve member by the high pressure fluid acting on a back side of the valve member, to hold the valve member in a closed condition, the valve member having an annular sealing surface between an outlet from a dose chamber, and an inlet to a working chamber,
Passing high pressure fluid from the dump chamber to the dose chamber via a flow path,
Reducing the pressure of the dump chamber such that the high pressure fluid in the dose chamber, acting on a front side of the valve member, forces the valve member to an open condition presenting a gap between the inlet and the outlet,
Preventing flow of high pressure fluid from entering the dose chamber or the dump chamber when the valve member is open,
The high pressure fluid then entering the working chamber from the dose chamber to perform work on a workload within the working chamber.

Preferably the dump chamber and dose chamber when filled prior to reducing the pressure are at nearly the same pressure.

Preferably an exhaust valve is moved to a position where it closes off an exhaust port from the working chamber, until the work is done on the work load, at which time the exhaust port opens, for example under a bias.

Preferably the method includes the step of allowing the work load to return to the inlet end of the working chamber, any fluid between the work load and the inlet end exiting through the exhaust port.

Preferably the exhaust port is biased open save for when the high pressure fluid exits the dose chamber such that the bias is over come and the exhaust valve moves to the closing position of the exhaust port(s).

Preferably the dose valve member moves to the closed position once the work load moves to or toward the opposing end.

Preferably a trigger mechanism reduces the pressure in the dump chamber.

Preferably the work load is returned to the inlet end by a bias, such as, but not limited to a fluid cushion/pressure bias, or compressive member on a back, non-working side of the work load, and or a tensile member on a front working side of the work load.

CLAIMS

1. A **device**, comprising or including,

   a dump chamber that is annular in shape, to receive high pressure fluid from a high pressure fluid source,
   a dose chamber, to receive a flow of the high pressure fluid from the dump chamber via a flow path from the dump chamber to the dose chamber, having an outlet,
   a working chamber having an inlet end at an end thereof,
   a dose valve member with an annular sealing surface surrounding the inlet end,
   wherein with the dose valve member in a closed condition the sealing surface meets with an annular seat to seal the outlet; and with the dose valve member in an open condition a gap is presented between the annular sealing surface and the seat to allow high pressure fluid to move from the outlet to the inlet, and flow of high pressure fluid is prevented from entering the dose chamber or the dump chamber, wherein the high pressure fluid in the dump chamber, at least in part, holds the dose valve member in the closed condition, until the high pressure fluid pressure in the dump chamber is reduced, whereby the high pressure fluid in the dose chamber unseats the dose valve member to the open position.

2. A device as claimed in claim 1 wherein when the dose valve member is open flow of high pressure fluid is prevented from entering the dump chamber.

3. A device as claimed in claim 1 or 2 wherein the high pressure fluid flowing into the working chamber then performs work on a workload therein to expel it from, or move it to or toward, an opposing end of the working chamber, wherein as the work load is driven from the first end (or inlet end) to the second end (or opposing end) there is no fluid connection available from any high pressure fluid source to the work load driving assembly or chambers.

4. A device as claimed in claim 3 wherein the dose valve member slides linearly along a linear axis parallel to the major axis of the device wherein the work load, whether captive, such as a piston, or expelled, such as a projectile, slides linearly along the working chamber from the inlet end, to or towards the opposing, distal end, parallel to the major axis, and wherein the dump chamber, dose chamber, and working chamber, lie concentric with, or parallel with, the major axis.

5. A device as claimed in any one of claims 1 to 4 wherein there is an exhaust valve that is biased open, at or toward the inlet end, and which closes off an exhaust port under actuation from the high pressure fluid leaving the dose chamber, wherein the exhaust port opens when the work load is at or near the opposing end, under the action of the bias, wherein the bias on the exhaust valve is a spring, wherein the exhaust valve is a piston or diaphragm which is at least partially encircled by the dose valve, wherein, or in addition, the bias on the exhaust valve is a tensile member connected between the workload and the exhaust valve.

6. A device as claimed in any one of claims 1 to 5 wherein the dose valve is at least in part biased in the closed condition.

7. A device as claimed in any one of claims 1 to 6 wherein the dose chamber is a hollow volume radially outward or inward from the working chamber.

8. A device as claimed in any one of claims 1 to 7 wherein the flow path is via the dose valve, in a skirt of the dose valve.

9. A device as claimed in any one of claims 1 to 8 wherein there is a restriction in the flow path from the dump chamber to the dose chamber, such as a one-way valve, such that the dump chamber will add to the closing pressure of the dose valve even when filling the dose chamber.

10. A device as claimed in any one of claims 1 to 9 wherein the pressure in the dump chamber is reduced by a trigger mechanism or similar, wherein the trigger mechanism dumps the pressure in the dump chamber to atmosphere.

11. A device as claimed in any one of claims 1 to 10 wherein the workload is returned to the inlet end by a fluid cushion on a back side thereof, or a spring on a back side or front side, or a tensile member connected from a front side to or towards the inlet end.

12. A device as claimed in any one of claims 1 to 11 wherein there is a safety valve to selectively dump pressure from the dose chamber to prevent operation of the device, and

there is a slow leak safety valve that releases fluid pressure from the dose chamber should the high pressure fluid supply pressure drop below that of the dose chamber.

13. A **method of operating a high pressure fluid device**, comprising or including the steps of,

    Filling a dump chamber that is annular in shape with a high pressure fluid,
    Increasing a sealing pressure of a valve member by the high pressure fluid acting on a back side of the valve member, to hold the valve member in a closed condition, the valve member having an annular sealing surface between an outlet from a dose chamber, and an inlet to a working chamber,
    Passing high pressure fluid from the dump chamber to the dose chamber via a flow path,
    Reducing the pressure of the dump chamber such that the high pressure fluid in the dose chamber, acting on a front side of the valve member, forces the valve member to an open condition presenting a gap between the inlet and the outlet,
    Preventing flow of high pressure fluid from entering the dose chamber or the dump chamber when the valve member is open,
    The high pressure fluid then entering the working chamber from the dose chamber to perform work on a workload within the working chamber.

14. A method as claimed in claim 13 wherein the dump chamber and dose chamber when filled prior to reducing the pressure are at nearly the same pressure.

15. A method as claimed in claim 13 of 14 wherein an exhaust valve is moved to a position where it closes off an exhaust port from the working chamber, until the work is done on the work load, at which time the exhaust port opens, for example under a bias, and allowing the work load to return to the inlet end of the working chamber, any fluid between the work load and the inlet end exiting through the exhaust port, wherein the exhaust port is biased open save for when the high pressure fluid exits the dose chamber such that the bias is over come and the exhaust valve moves to the closing position of the exhaust port(s).

16. A method as claimed in any one of claims 13 to 15 wherein the dose valve member moves to the closed position once the work load moves to or toward the opposing end.

17. A method as claimed in any one of claims 13 to 16 wherein a trigger mechanism reduces the pressure in the dump chamber.

18. A method as claimed in any one of claims 13 to 17 wherein the work load is returned to the inlet end by a bias, such as, but not limited to a fluid cushion/pressure bias, or compressive member on a back, non-working side of the work load, and or a tensile member on a front working side of the work load.

19. A method as claimed in any one of claims 13 to 18 wherein the dump chamber, and dose chamber are free to fill again once the dose valve member is in a closed position, wherein, or in addition, the filling of the dump chamber aids in closing the dose valve member.

20. A method as claimed in any one of claims 13 to 19 wherein the method includes the step of optionally dumping the high pressure fluid in the dose chamber to atmosphere to prevent the device from operating.