ROTARY SHEER VALVE WITH WASH AND PURGE STATION

TECHNICAL FIELD

This invention relates to shear valves which aligh selected ports for transferring fluids along various conduits.

BACKGROUND ART

Many types of linear and rotary shear valves are known. Generally, a shear valve comprises a stationary member having a flat surface, through which a single port is formed and connected to a supply or receiving fluid element. A moving member generally having a plurality of ports connected to individual fluid conduits engages the flat surface of the stationary member, generally through a number of sealing elements adjacent each individual port. The valve operates through sliding movement between the stationary and moving members to axially align one of the individual ports in the moving member with the port in the stationary member. Thus, by selectively moving the movable member, an individual port which it comprises can be aligned with the port in the stationary member to complete a fluidic path and flow fluid.

Shear valves generally suffer from a common problem relating to their ability to form a seal between the stationary and moving members. The sealing element positioned between the moving member and the stationary member must provide a leak free seal between the members even after a considerable amount of wear. This requires the face of the sealing element, which generally engages and slides against the surface of the stationary member, to maintain complete sealing engagement. If the surface on which the sealing element slides is adequately finished and adequate means of lubrication is provided to prevent significant wear of the sealing member, seal integrity can usually be easily maintained. However, many environments in which shear valves are used are contaminated with foreign materials and abrasives which significantly reduce the ability of the sealing element to maintain a leak proof seal.

For instance, when dirt, crystalline residues, or corrosives can adhere to or become embedded in the surface upon which the sealing element must slide, it can be easily understood that the increased wear which this may cause significantly reduces the life of the seal. This can easily lead to premature seal failure and leakage, which in turn can result in even more build-up of dirt, residues and corrosive materials.

Attempts to enclose the critical portions of the valve from the surrounding environment have been ineffective since leakage of fluids which the valve is transmitting can easily cause sufficient contamination to severely affect their life. Thus, sealing rings and enclosures alone have not been effective in significantly aiding performance of shear valves, particularly in environments where salts, oxides and corrosive agents are being directed by the valve.

DISCLOSURE OF THE INVENTION

The present invention is a rotary shear valve which comprises a structure permitting a purge and cleaning function to cleanse the sealing surfaces which sealing elements must engage. The mating faces of the moving and stationary portions of the valve are constructed to provide a passage through which rinse fluid may be flowed to wash and purge residue and contamination from the critical sealing surfaces of the valve. Rise fluid is provided through cooperation of existing ports formed in the valve where one of the conduits is used to flow a rinse solution which is directed by the valve. If none of the existing conduits of the valve are used to flow a wash solution, an alternate port may be added to accomplish wash and purge functions through this design. Rinse solution flowing through the valve is removed through a drain port included in the valve structure which directs fluid and debris from the sealing surfaces to a selected waste receptacle.

Additionally, an elastomeric seal is provided to securely enclose the area in which the sealing surfaces are located to prevent environmental contaminants from entering the sealing area and cause wear of the sealing surfaces of the valve.

The advantages of the presented invention are increased service life of the shear valve due to reduced wear of the sealing surfaces from contaminants. This results from improved seal performance due to reduced wear and abrasion, thus reducing leakage. Additionally, reduced contaminants in the area of seal formation in the valve results in reduced cross contamination between the fluids flowed through the various ports which the valve directs. This is particularly important when the shear valve is used to direct fluids used in scientific analysis and testing. Enclosing the sealing area additionally reduces evaporation of fluid residues remaining on the sealing surfaces in this area, thus retarding contamination buildup, crystallization, etc. Periodic wash and purge events are directed sufficiently often to assure that crystalline residue and large amounts of contaminants cannot be built up.

Though the invention which Applicant is describing is embodied in a rotary type shear valve, a similar structure to permit wash and purge may be adapted to linear shear valves, as well as others that function with curvilinear motion.

DESCRIPTION OF THE DRAWING

The FIGURE depicts a cross section of a rotary shear valve illustrating a sealing element and a construction of a movable portion of the valve which permits washing and purge of contaminants and debris. Additionally, it depicts a piston pump which is shown as an example of a fluidic element with which the shear valve can communicate.

BEST MODE OF THE INVENTION

Referring to the drawing, a cross section of a rotary shear valve is shown. The valve comprises a rotor **10** which is supported by and rotates about the bearing surface of a shoulder bolt **12**. A lower portion of rotor **10** has gear teeth **14** formed around its circumference for engagement with a gear train (not shown) to rotate the rotor for operation of the valve. A recessed upper portion **16** forms shoulder **18** which provides a circumferential sealing surface. The rotor **10** is preferably made of a rigid plastic, however it may be constructed of a metal or other suitable material.

A frame member **20** supports a stator plate **22** which is fastened to it by one of a number of mechanical fastening means. The stator plate **22** is preferably circularly shaped and positioned for concentric alignment with the rotor **10**. The stator plate **22** provides a down-