

SPECIFICATION

An Improved Valve

This invention relates to an improved valve which has been developed primarily for use in association with flexible pipes or conduits to control the rate of fluid flow therethrough. The invention is also suitable for general application in association with rigid conduits where fine control of the rate of flow is required and especially in situations where the fluid flowing through the conduit contains highly abrasive materials.

There are in existence many types of control valves for flexible pipes, most of them being rubber sleeve valves or pinch valves which work on the principle of squeezing a flexible rubber sleeve to restrict flow. This causes the circular orifice to become distorted and extreme wear occurs at the pinched area due to rubber in tension at the fluid surface. Flow control is difficult due to non-linearity of the closure. Generally, the size of the valve is large for the passing capacity.

The present invention envisages a valve for fluid conduits, said valve including two cylinders arranged parallel to each other with their circumferential surfaces in contact, at least one of said cylinders having a circumferentially extending groove formed in the surface thereof the depth of which varies along its length, said cylinders at the, or each, groove defining an aperture through which, in use, fluid is constrained to pass, whereby upon rotation of said cylinders relative to each other the size of said aperture varies to vary the rate of flow of fluid through said valve.

In order that the invention may be more readily understood it will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a diagrammatic perspective view of the main elements of a valve according to the invention,

Figure 2 is an external view of a valve according to the invention,

Figure 3 is a cross-sectional view on line B—B of Figure 2, and

Figure 4 is a cross-sectional view on line A—A of Figure 2.

The valve has a casing 10 made from a suitable metal which may be aluminium. Within the casing there is a valve chamber 12 having a lining 13 made from a corrosion and abrasion resistant material such as polyurethane. The upper and lower covers 14 and 16 of the casing are provided with recesses 18 having bearings of nylon or other suitable material to receive respective shafts 20 and 22.

Valve cylinders 24, 26 are moulded from a suitable material such as polyurethane directly onto the shafts 20, 22 and are prevented from rotation relative to the shafts by respective flats 28, 30 on the shafts. In a situation where corrosive material is likely to be encountered, the shafts 20, 22 are preferably made from stainless

steel. The upper ends of the shafts are provided with square sections 32, 34 on which respective pinion gears 36, 38 preferably made of nylon are mounted.

The gears are held in position on the shafts by means of nuts 40 and washers 42. The gears 36, 38 are identical and are of such diameter that their teeth intermesh to ensure that the shafts 20, 22 will rotate at the same speed as each other and in opposite directions. The gears are driven by means of the rack 44 which may be made from stainless steel and which is moved to and fro along its axis to vary the valve opening by means of a fluid operated ram, such as an air cylinder, or by other suitable means.

As best shown in Figures 1 and 4, each of the valve cylinders 24, 26 has a groove of varying cross-section formed around its periphery. Each groove has a minimum depth at point 46 (see Figure 4) and a maximum depth at point 48. The cross-section of each groove is preferably semi-circular and the meshing of the gears 36, 38 is so arranged that points 46 of the respective valve cylinders are in contact when the valve is closed.

By operation of the rack drive to rotate gears 36, 38 shafts 20, 22 and valve cylinders 24, 26, it is possible to produce an in-line flow aperture 50 of circular cross-section having a diameter from zero to a maximum valve equal to the internal diameter of the input-output passages 52.

To seal the valve cylinders 24, 26 in the valve chamber 12, the surface of valve chamber lining 13 which contacts the valve cylinders 24, 26 has a series of serrations 53 formed in it parallel to the axes of the shafts 20, 22. The relative dimensions of the valve cylinders 24, 26 are selected to provide a slight pressure between the crests of the serrations and the external surfaces of the valve cylinders.

The sealing of the valve cylinders 24, 26 in the valve chamber is also assisted by the provision of annular sealing projections 54 on the upper and lower surfaces of each valve cylinder 24, 26, the projections preferably exerting a small pressure against the adjacent surfaces of the lining.

The valve may be connected into a flexible pipe by cutting the pipe and connecting the cut ends to the valve casing by means of appropriate couplings or by the provision of flanges.

It will be clear that the use of the valve is not restricted to flexible pipes and that it can be used where appropriate with rigid metal pipes.

The valve of the invention has application in many different industries for many different purposes but, in the case of the present applicant, the valve is seen as being useful mainly in situations where a liquid carrying lime is to be transported, for controlling the tails being discharged from a flotation cell and in concentrate filter feed lines.

125 Claims

1. A valve for fluid conduits, said valve including two cylinders arranged parallel to each other with their circumferential surfaces in



SPECIFICATION

An Improved Valve

This invention relates to an improved valve which has been developed primarily for use in association with flexible pipes or conduits to control the rate of fluid flow therethrough. The invention is also suitable for general application in association with rigid conduits where fine control of the rate of flow is required and especially in situations where the fluid flowing through the conduit contains highly abrasive materials.

There are in existence many types of control valves for flexible pipes, most of them being rubber sleeve valves or pinch valves which work on the principle of squeezing a flexible rubber sleeve to restrict flow. This causes the circular orifice to become distorted and extreme wear occurs at the pinched area due to rubber in tension at the fluid surface. Flow control is difficult due to non-linearity of the closure. Generally, the size of the valve is large for the passing capacity.

The present invention envisages a valve for fluid conduits, said valve including two cylinders arranged parallel to each other with their circumferential surfaces in contact, at least one of said cylinders having a circumferentially extending groove formed in the surface thereof the depth of which varies along its length, said cylinders at the, or each, groove defining an aperture through which, in use, fluid is constrained to pass, whereby upon rotation of said cylinders relative to each other the size of said aperture varies to vary the rate of flow of fluid through said valve.

In order that the invention may be more readily understood it will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a diagrammatic perspective view of the main elements of a valve according to the invention,

Figure 2 is an external view of a valve according to the invention,

Figure 3 is a cross-sectional view on line B—B of Figure 2, and

Figure 4 is a cross-sectional view on line A—A of Figure 2.

The valve has a casing 10 made from a suitable metal which may be aluminium. Within the casing there is a valve chamber 12 having a lining 13 made from a corrosion and abrasion resistant material such as polyurethane. The upper and lower covers 14 and 16 of the casing are provided with recesses 18 having bearings of nylon or other suitable material to receive respective shafts 20 and 22.

Valve cylinders 24, 26 are moulded from a suitable material such as polyurethane directly onto the shafts 20, 22 and are prevented from rotation relative to the shafts by respective flats 28, 30 on the shafts. In a situation where corrosive material is likely to be encountered, the shafts 20, 22 are preferably made from stainless

steel. The upper ends of the shafts are provided with square sections 32, 34 on which respective pinion gears 36, 38 preferably made of nylon are mounted.

The gears are held in position on the shafts by means of nuts 40 and washers 42. The gears 36, 38 are identical and are of such diameter that their teeth intermesh to ensure that the shafts 20, 22 will rotate at the same speed as each other and in opposite directions. The gears are driven by means of the rack 44 which may be made from stainless steel and which is moved to and fro along its axis to vary the valve opening by means of a fluid operated ram, such as an air cylinder, or by other suitable means.

As best shown in Figures 1 and 4, each of the valve cylinders 24, 26 has a groove of varying cross-section formed around its periphery. Each groove has a minimum depth at point 46 (see Figure 4) and a maximum depth at point 48. The cross-section of each groove is preferably semi-circular and the meshing of the gears 36, 38 is so arranged that points 46 of the respective valve cylinders are in contact when the valve is closed.

By operation of the rack drive to rotate gears 36, 38 shafts 20, 22 and valve cylinders 24, 26, it is possible to produce an in-line flow aperture 50 of circular cross-section having a diameter from zero to a maximum valve equal to the internal diameter of the input-output passages 52.

To seal the valve cylinders 24, 26 in the valve chamber 12, the surface of valve chamber lining 13 which contacts the valve cylinders 24, 26 has a series of serrations 53 formed in it parallel to the axes of the shafts 20, 22. The relative dimensions of the valve cylinders 24, 26 are selected to provide a slight pressure between the crests of the serrations and the external surfaces of the valve cylinders.

The sealing of the valve cylinders 24, 26 in the valve chamber is also assisted by the provision of annular sealing projections 54 on the upper and lower surfaces of each valve cylinder 24, 26, the projections preferably exerting a small pressure against the adjacent surfaces of the lining.

The valve may be connected into a flexible pipe by cutting the pipe and connecting the cut ends to the valve casing by means of appropriate couplings or by the provision of flanges.

It will be clear that the use of the valve is not restricted to flexible pipes and that it can be used where appropriate with rigid metal pipes.

The valve of the invention has application in many different industries for many different purposes but, in the case of the present applicant, the valve is seen as being useful mainly in situations where a liquid carrying lime is to be transported, for controlling the tails being discharged from a flotation cell and in concentrate filter feed lines.

125 Claims

1. A valve for fluid conduits, said valve including two cylinders arranged parallel to each other with their circumferential surfaces in

- contact, at least one of said cylinders having a circumferentially extending groove formed in the surface thereof the depth of which varies along its length, said cylinders at the, or each, groove
- 5 defining an aperture through which, in use, fluid is constrained to pass, whereby upon rotation of said cylinders relative to each other the size of said aperture varies to vary the rate of flow of fluid through said valve.
- 10 2. A valve as claimed in claim 1, wherein opposed grooves are provided in the surfaces of said cylinders to define said aperture.
3. A valve as claimed in claim 1 or 2, wherein the, or each, groove is of semi-circular cross-
- 15 section.
4. A valve as claimed in any one of the preceding claims, wherein means are provided to rotate said cylinders in unison and in opposite directions.
- 20 5. A valve as claimed in claim 4, wherein said cylinders have extended support shafts formed integrally therewith, or attached thereto, and said means for rotating said cylinders in unison and in opposite directions are a pair of identical pinion
- 25 gears carried by the respective shaft extensions and meshing with each other.
6. A valve as claimed in claim 5, wherein said pinion gears are rotated by means of a rack meshing with one of said pinion gears and linearly
- 30 movable to rotate said pinion gears and therefore said cylinders.
7. A valve as claimed in claim 6, wherein said rack is moved by a fluid operated ram.
8. A valve for fluid conduits, substantially as
- 35 hereinbefore described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained

