

Description

This invention relates to rotary valves and the sealing thereof, and in particular embodiments to wipers for incorporation into a rotary disk valve, the wiper being operative to remove surface contaminants from the periphery of the valve disk as the valve disk moves from an opened position permitting through-flow past the valve disk and a closed position in which the valve disk cooperates with a valve seating of the housing of the valve to inhibit flow through the valve.

BACKGROUND

Rotary disk valves are well-known in the art, and are comprised of a valve disk that is carried by a rotatable shaft. More commonly, the central axis of the shaft extends in, or parallel to, the central plane of the valve disk, but, this is not essential to such a rotary disk valve construction.

EP-A- 447023, which represents the prior art as referred to in the respective preambles of claims 1 and 4, teaches a disk valve construction in which a composite disk valve is positioned with the central plane of the valve disk extending at an angle to the longitudinal axis of the valve shaft. In that patent, the disk valve specifically is formed as a two-part construction, as is the housing for the disk valve, thus allowing for closure and sealing of the respective halves of the housing by the respective halves of the disk valve prior to separation of the two halves of the housing from each other, thus to provide a dry break coupling.

In the case of the commonly known disk valve, which may have, but does not essentially require an elastomeric seal extending peripherally of the valve disk, the requirement arises that the periphery of the valve disk must be kept free of debris and particulate matter as it moves onto the associated valve seat, especially when the valve is to be employed in pipe lines carrying abrasive slurries. The presence on the edge of the valve disk of abrasive particles can result in leakage past the valve disk, and also result in leakage past the valve disk, and also result in abrasion and scouring of the edge of the valve disk, or, abrasion and scouring of the valve seat with which the valve disk cooperates, and, and eventual decrease in the sealing effectiveness of the valve.

While these considerations also can apply in the construction of EP-A-447023 a further and more pressing requirement is present, that being, prior to separation of the valve halves, the requirement to wipe contaminants from the surface of an elastomeric seal that extends peripherally of the valve disk, the liquid contaminants envisaged being of a highly flammable and potentially explosive nature, or other noxious fluids.

The invention is defined by claims 1 and 4; pre-

ferred features are set out in the dependent claims.

In one aspect, the housing of a valve is provided with an internal wiper that extends peripherally of the valve seat, and which extends radially inwardly of the valve seat to a small extent when the disk valve is in an opened position, the internal wiper being operative to wipe the periphery of the valve disk clean as the valve disk is moved from the opened position to a closed position in which it cooperates with the valve seat.

When employed in conjunction with a split valve disk as disclosed in EP-A-447023 a wiper is incorporated into each of the coupling halves, the respective wipers, in the assembled condition of the valve housing, cooperating one with the other to further enhance the wiping action of the respective squeegee as the valve disk moves to a closed position in which it cooperates with the valve seat in sealing relationship therewith.

Further, the respective wipers are arranged to cooperate with one another in such a manner that they eliminate any spaces between each other and the associated elastomeric seals on the respective valve disk halves in which fluid could be entrapped.

Preferably a housing for a rotary disk valve has a valve seat with which the periphery of a valve disk cooperates, the housing providing a seating and support for a wiper formed from an elastomeric material, the wiper extending circumferentially of the valve seat.

The seating for the wiper is so arranged that it produces compression of the wiper in the axial direction of the valve axis, in order to cause extrusion of the elastomeric material of the wiper in a direction radially inwards of the valve axis. The seating for the wiper also is so arranged that it provides for displacement of the material of the wiper in a direction radially outwards of the valve axis under the influence of forces imposed on the inner periphery of the wiper by the valve disk as the valve disk moves to a closed position.

In a preferred embodiment of the invention having specific relation to a dry break coupling, e.g. as shown in EP-A-447023, each of the housing halves of the coupling is formed to provide a seating for a wiper, and, a separate wiper is incorporated into each of the housing halves. The respective wipers in the assembled condition of the coupling cooperate one with the other to further enhance the wiping action on the periphery of the valve disk in such a manner as to exclude any spaces between the respective wipers and the cooperating edge of the valve disk halves that could otherwise provide space for the entrapment of fluid.

Having so arranged the respective wipers that they are virtually dry and free from any spaces in which fluid can be entrapped, the respective housing halves can then be separated one from the other in what is essentially the total absence of any spillage

of the liquid contained in the pipe lines associated with the respective housing halves.

DESCRIPTION OF THE DRAWINGS

An embodiment of the invention and alternative embodiments thereof will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a longitudinal cross-section through a valve showing the valve members in a closed position;

Fig. 2 is an enlarged fragmentary detail of that portion of the valve seating that is encircled by the chain-line A in Fig. 1;

Fig. 3 is a view corresponding with Fig. 2, but showing the two seating portions and wipers when separated one from the other;

Fig. 4 is a view corresponding with Fig. 1, but showing the valve members in a position that they occupy on approaching full closure of the valve members;

Fig. 5 illustrates in longitudinal cross-section an alternative embodiment of the invention; and,

Fig. 6 illustrates in horizontal longitudinal cross-section another alternative embodying the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring first to Fig. 1, a quick connect coupling is shown in longitudinal cross-section of the type disclosed in EP-A-447023. The coupling comprises two coupling halves which are indicated generally at 10 and 12, the respective coupling halves each incorporating a stub shaft 14, 16 which carries one-half 18, 20 of a composite disk valve.

The stub shafts 14 and 16 are rotatable nominally through an angle of 90°, rotation of that stub shaft producing rotation of the associated valve disk half from a fully opened to a fully closed position or vice versa, the motion of that valve disk half being transmitted to the other of the valve disk halves, thus causing both of the valve disk halves to move in unison.

As is described in EP-A-447023 when the valve disk halves are in the position shown in Fig. 1 of the drawings, the respective coupling half members can be separated one from the other, separation of the coupling halves occurring in the almost complete absence of spillage of the fluid being conveyed through the respective coupling halves, thus to provide a dry break coupling. Typically, the liquids conveyed by such a coupling will be gasoline, kerosene, aircraft fuel and the like, such liquids being highly flammable and chemicals, effluents and other noxious fluids. When formed of stainless steel, the coupling can be employed for the bulk handling of liquid foodstuffs, such as milk, fruit juices, edible oils, beers, wines, soups and sauces, etc.

As will be appreciated, when the respective disk valve halves 18 and 20 are in the opened position of the coupling, those valve halves are immersed in the conveyed liquid, and, their outwardly presented surfaces, including the peripheries thereof, are immersed in and wetted by that fluid. Again, as taught in EP-A-447023 the arrangement is such that the fluid can not pass into the space between the respective disk halves 18 and 20, sealing members being provided to inhibit the ingress of the liquid between the respective disk halves.

Those sealing members are shown in larger scale in Figs. 2, 3, and 4, the seal associated with the disk half 18 being shown at 22, and, the seal associated with the disk half 20 being shown at 24.

Fig. 2 is an enlarged scale cross section of the portion A circled in Fig. 1, Fig. 2 showing a fragment of the respective coupling halves 10 and 12, and, a fragment of the disk halves 18 and 20 when in the closed position of the valve.

Positioned and secured within the juxtaposed end faces of the coupling halves 10 and 12, and encircling the periphery of the composite valve member 18, 20, are wiper members 26 and 28. The wiper members are secured to the respective coupling halves 10 and 12 by means of annular rings 30 and 32, which respectively are attached directly to the coupling half 10 and the coupling half 12 by screws (not shown). In this manner, the wiper members 26 and 28 are secured within the end faces of the respective coupling halves 10 and 12 in a manner that permits limited movement between the respective wiper members 26 and 28 relative to the coupling halves 10 and 12, while at the same time, the wiper members 26 and 28 remain firmly attached to their associated coupling half 10 or 12.

The respective wiper members 26 and 28 each include a wiper lip 26a, 28a that extends in a direction radially inwardly of the longitudinal axis of the coupling, and which, as is illustrated in Fig. 4, extend radially inwardly beyond the valve seats 11 and 13 provided by the respective coupling halves 10 and 12. In Fig. 4, the disk valve halves 18 and 20 are shown approaching the valve seats 11 and 13, the leading edge of the seal 24 at that time being progressively compressed into sealing engagement with the valve seat 11. This results in a radially inwards displacement of the sealing member 24, which progressively proceeds to the sealing member 22, as is illustrated in Fig. 2.

At that time, and up to separation of the coupling halves, the seals 22 and 24 are in compressive face engagement with each other, this eliminating any seepage of the fluid into stages that possibly exist between the juxtaposed side faces of the valve discs 18 and 20.

Further, during the progression of the sealing members 24 and 22 into position on the respective

valve seats 11 and 13, the mutually presented side faces of the respective sealing members 22 and 24 are caused to pass under the sealing lips 26a and 28a. In the process, this wipes any residual liquid from the outer periphery of the sealing members, while at the same time, the sealing lips 26a and 28a are forced radially outwards for them further to increase the compressive force exerted on the sealing members 22 and 24.

Ultimately, the sealing members reach the position shown in Fig. 2, at which time the wipers 26a and 28a have wiped clean the underlying surface of the sealing members 22 and 24, leaving the juxtaposed surfaces both clean and devoid of any pockets of the conveyed liquid.

At that time, the respective coupling halves 10 and 12 are firmly attached one to the other, the movement of the wiper members 26a and 28a having in turn increased the compressive force exerted between the respective wiper members, and, having increased the compressive force acting on the outer peripheries of the seal members 22 and 24. This acts effectively to squeeze out any remaining minor traces of the liquid contaminants that initially were present on the sealing members 22 and 24.

At that time, and as illustrated in Fig. 3, the respective coupling halves 10 and 12 can be separated one from the other in the absence of any spillage of the conveyed liquid, the respective coupling halves then being fully sealed and closed by the associated disk valve half 18 or 20 and its associated sealing member 22 and 24, which is at that time fully seated on the associated valve member 11 or 13, the wiper members 26 and 28 then acting to further enhance the effectiveness of the seal.

Figs. 1 through 4 show the application of the invention in a coupling having identically-formed coupling halves. Fig. 5 shows an embodiment of the invention in which the respective coupling halves are dissimilar, Fig. 6 showing another embodiment of the invention in which the wipers are operative to wipe clean the entire outer surface of the sealing member associated with the valve disk, prior to the periphery of the valve disk traversing the valve seat.

The coupling of Fig. 5 is not a dry break coupling, but instead, is a standard form of coupling incorporating a single disk valve, which effectively is a segment of a ball valve.

In Fig. 5, the disk valve 50 is provided on its outer surface with a seal 52, the disk valve 50 being supported for rotation by a stub shaft 54 that is journaled for rotation in a coupling half 56. Thus, upon rotation of the stub shaft 54 in an appropriate direction, the valve disk 50 is moved into the position shown in Fig. 5, the outer periphery of the seal 52 having wiped clean by wiper members 58 identical with those described with reference to Figs. 2, 3 and 4. The valve halves 56 and 58 illustrated in Fig. 5 either can be de-

tachable one from the other, or, those halves can be permanently affixed one to the other in order to provide a unitary disk valve construction.

Similarly, in Fig. 6, the valve halves 66 and 68 can either be detachable one from the other, or, they can be permanently affixed to each other. In Fig. 6, a conventional butterfly type disk valve 60 is illustrated, having a peripheral edge seal 62, which, prior to its reaching seating engagement with the valve seat 70, is wiped clean and dry by wiper members 72 identical in construction with those discussed with reference to Figs. 2, 3 and 4. In Fig. 6, the butterfly valve 60 is supported for rotation within the valve seat 70 by stub shafts 64.

Various other shapes of the wipers will occur to those skilled in the art, as will be the manner of securing the wipers to the associated valve halves, or, securing the wipers within the valve body.

As will be appreciated, due to the fact that elastomers having rubberlike characteristics are essentially incompressible, space must be provided to accommodate displacement of the wiper lips 26 and 28a into the valve seats 10 and 11 under the stress imposed by the valve member.

In the illustrated embodiments, this is provided by minor air filled gaps 26b and 28b provided in the vicinity of the retaining rings 30, 32. Other configurations and positioning of those air gaps will suggest itself, the requirement being that, in the closed condition of the coupling halves, sufficient free space is present to permit retraction of the wiper lips 26a and 28a into the associated valve seat 11, 12.

Claims

1. A rotary valve having a valve body comprising complementary interfitting valve halves (10,12) providing respective valve seats, each including a respective valve member (18,20) rotatable relative to said valve seats between a first position permitting fluid flow through said valve body and a second position preventing fluid flow through said valve body, the valve members (18,20) each having an elastomeric seal (22,24) on an outer circumference thereof; characterised in that elastomeric wiper members (26,28) are provided extending circumferentially around said respective valve seats, in an unstressed condition extending radially inwardly of said valve seats to wipe the circumferential seals (22,24) of said valve members (18,20) as said valve members are moved from said first position to said second position, said wiper members (26,28) being supported for limited movement relative to said valve seats so that stressing of said wiper members (26,28) on contact with said valve members (18,20) causes said wiper members

valve seats 11 and 13, the mutually presented side faces of the respective sealing members 22 and 24 are caused to pass under the sealing lips 26a and 28a. In the process, this wipes any residual liquid from the outer periphery of the sealing members, while at the same time, the sealing lips 26a and 28a are forced radially outwards for them further to increase the compressive force exerted on the sealing members 22 and 24.

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(26,28) to retract into said respective valve seats.

2. A rotary valve according to claim 1; wherein the valve halves (10,12) each have a recess for receiving said respective wiper members (26,28), the recess being of greater cross-sectional area than said respective wiper members (26,28) to accommodate displacement of the radially inwardly extending portions of said wiper members (26,28) into said respective recesses.

3. A rotary valve according to claim 2, wherein said wiper members (26,28) are positioned within respective annular recesses in end face surfaces of respective said valve halves, and respective retainer members (30,32) are attached to said respective end faces to confine said wiper members (21,22) in said recesses.

4. A rotary valve having a housing defining a through passage, a valve disk (18,20; 50;60) having an elastomeric seal (22,24; 52; 62) on the outer circumferential surface thereof positioned within said passage and supported for rotation about an axis (14;54;64) transverse to a longitudinal axis of said passage, said valve disk being movable between a first position in which it permits through flow through said passage, and a second position in which said valve disk provides a closure for said valve seat of said valve, characterised by:

a wiper member (26,28;58;72) operative to wipe clean an outermost peripheral surface of said elastomeric seal, secured in said housing and extending peripherally of said passage, said wiper member, in an unstressed condition, extending radially inwards of an inner periphery of said passage and extending into the path of movement of said valve disk when said valve disk is moving between said opened and said closed positions, said wiper member being formed of a resilient elastomeric material capable of radially outwards displacement under the influence of stressing of said wiper member by said valve disk.

Patentansprüche

1. Drehventil mit einem Ventilkörper, umfassend komplementäre aneinanderpassende Ventilhälften (10, 12), die jeweilige Ventilsitze bilden, wobei jede ein jeweiliges Ventilelement (18, 20) enthält, das relativ zu den Ventilsitzen zwischen einer ersten Position, die den Fluiddurchfluß durch den Ventilkörper ermöglicht, und einer zweiten Position, die den Fluiddurchfluß durch den Ventilkörper verhindert, drehbar ist, wobei die Ventil-

elemente (18, 20) jeweils eine Elastomerdichtung (22, 24) an einem Außenumfang davon aufweisen; dadurch gekennzeichnet, daß Elastomer-Wischerelemente (26, 28) vorgesehen sind, die sich um den Umfang der jeweiligen Ventilsitze herum erstrecken, wobei sie sich in einem entspannten Zustand von den Ventilsitzen radial nach innen erstrecken, um die Umfangsdichtungen (22, 24) der Ventilelemente (18, 20) zu wischen, wenn die Ventilelemente von der ersten zur zweiten Position bewegt werden, wobei die Wischerelemente (26, 28) zur beschränkten Bewegung relativ zu den Ventilsitzen abgestützt sind, sodaß das Unter-Spannung-Setzen der Wischerelemente (26, 28) beim Kontakt mit den Ventilelementen (18, 20) bewirkt, daß sich die Wischerelemente (26, 28) in die jeweiligen Ventilsitze zurückziehen.

2. Drehventil nach Anspruch 1, worin die Ventilhälften (10, 12) jeweils eine Ausnehmung zur Aufnahme der jeweiligen Wischerelemente (26, 28) aufweisen, wobei die Ausnehmung eine größere Querschnittsfläche als die jeweiligen Wischerelemente (26, 28) besitzt, um die Verschiebung der radial nach innen verlaufenden Abschnitte der Wischerelemente (26, 28) in die jeweiligen Ausnehmungen aufzunehmen.

3. Drehventil nach Anspruch 2, worin die Wischerelemente (26, 28) innerhalb jeweiliger ringförmiger Ausnehmungen in Endflächen der jeweiligen Ventilhälften angeordnet sind und jeweilige Halteelemente (30, 32) an den jeweiligen Endflächen befestigt sind, um die Wischerelemente (26, 28) in den Ausnehmungen zu halten.

4. Drehventil mit einem Gehäuse, das einen Durchgang definiert, wobei eine Ventilscheibe (18, 20; 50, 60) mit einer Elastomerdichtung (22, 24; 52, 62) auf der äußeren Umfangsfläche davon innerhalb des Durchgangs angeordnet ist und zur Drehung um eine zu einer Längsachse des Durchgangs quer verlaufenden Achse (14; 54; 64) gelagert ist, wobei die Ventilscheibe zwischen einer ersten Position, wo sie den Durchfluß durch den Durchgang ermöglicht, und einer zweiten Position, wo die Ventilscheibe einen Verschuß für den Ventilsitz des Ventils bildet, bewegbar ist, dadurch gekennzeichnet, daß ein Wischerelement (26, 28; 58; 72), das die Funktion hat, eine äußerste periphere Oberfläche der elastomeren Dichtung sauberzuwischen, im Gehäuse befestigt ist und sich peripher vom Durchgang erstreckt, wobei sich das Wischerelement in einem entspannten Zustand von einer Innenperipherie des Durchgangs radial nach innen und in den Bewegungsweg der Ventilscheibe hinein erstreckt,



wenn sich die Ventilscheibe zwischen der Offen- und der Geschlossen-Position bewegt, wobei das Wischerelement aus einem elastischen Elastomermaterial besteht, das unter dem Einfluß des Unter-Spannung-Setzens des Wischerelements durch die Ventilscheibe zu einer radialen Auswärtsverschiebung fähig ist.

Revendications

1. Vanne rotative ayant un corps de vanne, comprenant des moitiés de vanne complémentaires (10, 12) s'adaptant l'une à l'autre, réalisant des sièges de vanne respectifs, chacune incluant un élément de vanne respectif (18, 20) pouvant tourner relativement auxdits sièges de vanne entre une première position qui permet l'écoulement du fluide à travers ledit corps de vanne et une deuxième position qui empêche l'écoulement du fluide à travers ledit corps de vanne, les éléments de vanne (18, 20) ayant chacun un joint d'étanchéité (22, 24) en élastomère sur une circonférence extérieure de ceux-ci;

caractérisée en ce que des éléments formant raclette en élastomère (26,28) sont prévus, s'étendant circonférentiellement autour desdits sièges de vanne respectifs, s'étendant dans un état non contraint radialement vers l'intérieur desdits sièges de vanne pour essuyer les joints d'étanchéité circonférentiels (22,24) desdits éléments de vanne (18,20) lorsque lesdits éléments de vanne sont déplacés de ladite première position à ladite deuxième position, lesdits éléments formant raclette (26,28) étant supportés pour un mouvement limité relativement auxdits sièges de vanne, de telle sorte que la contrainte desdits éléments formant raclette (26,28) lors du contact avec lesdits éléments de vanne (18,20) amène lesdits éléments de raclette (26,28) à se retirer dans lesdits sièges de vanne respectifs.

2. Vanne rotative selon la revendication 1, dans laquelle les moitiés de vanne (10,12) ont chacune un évidement pour recevoir lesdits éléments respectifs formant raclette (26,28), l'évidement ayant une zone plus grande en section transversale que lesdits éléments respectifs formant raclette (26,28) pour permettre le déplacement des portions s'étendant radialement vers l'intérieur desdits éléments formant raclette (26,28) dans lesdits évidements respectifs.

3. Vanne rotative selon la revendication 2, dans laquelle lesdits éléments formant raclette (26,28) sont positionnés dans des évidements annulaires respectifs dans des faces d'extrémité desdites moitiés de vanne respectives, et des éléments

de retenue respectifs (30,32) sont fixés auxdites faces d'extrémité respectives pour confiner lesdits éléments formant raclette (21,22) dans lesdits évidements.

4. Vanne rotative ayant une chambre définissant un passage traversant, un disque de vanne (18,20;50;60) ayant un joint d'étanchéité en élastomère (22,24;52;62) sur la surface circonférentielle extérieure de celui-ci, positionné dans ledit passage et supporté à rotation autour d'un axe (14;54;64) transversal à un axe longitudinal dudit passage, ledit disque de vanne étant déplaçable entre une première position dans laquelle il permet l'écoulement à travers ledit passage et une deuxième position dans laquelle ledit disque de vanne réalise une fermeture dudit siège de vanne de ladite vanne, caractérisée par :

un élément formant raclette (26,28;58;72), fonctionnant pour nettoyer une surface périphérique la plus extérieure dudit joint d'étanchéité en élastomère, fixé dans ladite chambre et s'étendant sur la périphérie dudit passage, ledit élément formant raclette, dans un état non sollicité, s'étendant radialement vers l'intérieur d'une périphérie interne dudit passage et s'étendant dans le trajet de déplacement dudit disque de vanne lorsque ledit disque de vanne se déplace entre lesdites positions ouverte et fermée, ledit élément formant raclette étant réalisé en un élastomère élastique apte à se déplacer radialement vers l'extérieur sous l'influence de la contrainte dudit élément formant raclette par ledit disque de vanne.

