

Description

This invention relates to vortex valves and is more particularly concerned with a vortex valve including a means by which the inlet to the valve may be by-passed.

Vortex valves are devices for controlling fluid flow by a hydraulic effect without requiring moving parts. US Patent No. 4206783 discloses a vortex valve having a conical vortex chamber with a tangential inlet and an outlet disposed at the narrower end of the chamber. At low flow rates, water entering through the inlet passes through the vortex chamber to the outlet with substantially no pressure drop and the valve can be considered to be open. However, at high flow rates, water enters through the inlet with enough energy to create a vortex in the vortex chamber which results in a considerable pressure drop between the inlet and the outlet and may greatly restrict flow through the outlet, or even substantially cut it off altogether. Thus the valve serves to limit the rate of flow through it automatically. Vortex valves of this type can be used, for example, to control the flow of storm water in sewers, to ensure that equipment downstream of the valve is not overloaded during periods of heavy rainfall.

One problem with prior art vortex valves is that the vortex chamber, or the inlet to the vortex chamber, may become blocked by debris from the gully in which the vortex valve is fitted. This causes liquid to build up in the gully, submerging the vortex valve and requires unpleasant and difficult maintenance and cleaning work to be carried out in removing the blockage under water. Das Gas-und Wasserfach, vol. 123, no. 3, 1982, pages 166-167: "Mehr als 500 Wirbeldrosseln und Wirbelventile im Einsatz" shows a vortex regulator having an inspection cover.

According to a first aspect of the present invention there is provided a vortex valve comprising a housing defining a vortex chamber, the housing having an inlet through which liquid may enter the vortex chamber in a manner to promote swirl within the vortex chamber and an outlet at one axial end of the vortex chamber, a wall of the housing being provided with an opening normally closed by a closure, said closure being operable between the closed position and an open position in which liquid may enter the vortex chamber by-passing said inlet; characterised in that the closure is operable between the closed position and the open position by means remote from the vortex-valve.

The vortex valve may be provided at the outlet of a gully with the vortex-valve outlet communication with the gully outlet.

When a blockage occurs at the inlet of the vortex valve, and water builds up in the gully in which the vortex valve is situated, the closure is moved (either manually or automatically) to the open position, permitting the flooded gully to empty, the liquid in the gully by-

passing the inlet. Once the gully is empty, the vortex valve is readily accessible and the inlet easily cleaned. In some circumstances, the flow created when the closure is moved may dislodge debris in the vortex chamber or the inlet and cause it to pass through the outlet, so permitting the flooded gully to empty.

Preferably, the closure is held in the normally closed position by a spring which tends to urge the closure against a stop. It is not essential to provide an elaborate sealing means between the closure and the housing as the liquid head in the gully will normally be sufficient to press the closure tightly against the housing. When the gully is dry or substantially dry, the vortex valve is in a "dormant" state and the presence of a pressure head of liquid in the gully to press the closure tightly against the housing is not required.

A cord may be attached to the closure, the cord leading out of the gully in which the valve is situated, for remote opening of the closure.

Alternatively, a waterproof electrical actuator may be provided, responsive to a signal generated remotely, to open the closure.

Although the term "gully" is often used to mean a road gully, its intended meaning herein is broad and covers any liquid collection region or liquid interceptor through which liquid may flow.

According to a third aspect of the present invention, there is provided a method of unblocking a blocked vortex valve situated at the outlet of a flooded gully, said vortex valve comprising a housing defining a vortex chamber, the housing having an inlet communicating with the gully through which liquid may enter the vortex chamber in a manner to promote swirl within the vortex chamber and an outlet at one axial end of the vortex chamber, a wall of the housing being provided with an opening normally closed by a closure and said closure being operable between the closed position and an open position in which liquid may enter the vortex chamber from the gully by-passing the liquid inlet; said method comprising:

- (i) operating the closure from the normally closed position to the open position by a means remote from the vortex valve;
- (ii) permitting the flooded gully to drain through the opening in the housing and the gully outlet;
- (iii) removing any material blocking the vortex valve; and
- (iv) returning the closure to the closed position.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings in which:

Figure 1 is a plan view of part of a gully provided with a vortex valve;

Figure 2 is a section through the gully shown in Figure 1;

Figure 3 shows a wall of the housing of a vortex

valve in accordance with the first aspect of the present invention ;

Figure 4 is a view on the line IV-IV of Figure 3 ;

Figure 5 is a view on the line V-V of Figure 3 ;

Figure 6 is a plan view of another embodiment of a gully provided with a vortex valve ;

Figure 7 is a view on the line VII-VII of Figure 6 ; and

Figure 8 is a view on the line VIII-VIII of Figure 6.

Figures 1 and 2 show a vortex valve 40 in accordance with the present invention, in situ in a gully 42. The vortex valve 40 comprises a conical vortex chamber 44 having an inlet 46 and an outlet 48. The outlet 48 communicates with an outlet 30 of the gully. The end wall 2 of the valve 40 is provided with a by-pass mechanism of the type shown in Figures 3 to 5. Normally, the closure 6 is closed over the opening (not shown). A cord 14 attached to the closure 6 leads to a position remote from the vortex valve 40 and gully 42 where the opening and closing of the closure 6 can be controlled from an accessible position. Any water in the gully 42 enters the inlet 46 to the vortex chamber 44, passes through the vortex chamber and out of the outlet 48 thereof. During storm conditions, the rate of flow through the vortex valve 40 is sufficiently high to cause the liquid in the vortex chamber to swirl, which swirl will cause a braking effect on the flow of water through the valve 40. This will cause a build up of water in the gully 42. Thus, in storm conditions, the rate of flow of water out of the gully 42 is controlled. Should the vortex valve 40 become blocked during storm conditions, for example, by debris present in the gully which becomes trapped in the inlet 46 of valve 40, the water backs up in the gully 42 and, under extreme conditions, will flood out of the top of the gully 42. The vortex valve 40 may be unblocked by first pulling the cord 14 thereby moving the closure 6 to a position in which the opening is open. This permits water in the gully 42 to flow unimpeded through the vortex chamber 44 and out of the outlet 30, and the gully 42 soon drains. Once the gully 22 has drained, an operator can, if necessary, descend into the dry gully and unblock the vortex valve 40. Occasionally, however, it is not necessary for the vortex valve 40 to be cleaned manually as the action of the water flushing through the vortex chamber 44 may be sufficient to clean out the vortex valve.

In Figures 3, 4 and 5, a detail of a wall 2 of the housing of a vortex valve in accordance with the present invention is shown. The wall 2 shown is circular (Figure 1), and might, for instance, be the end wall of a vortex valve such as that shown in Figures 1 and 2. The wall 2 of the housing is provided with a combined opening 4 and closure member 6. Associated with the closure member 6 is an annular sealing member 8, a sleeve 10, a torsion spring 12, a cord 14 and retaining lugs 16. The opening 4 is normally closed by the closure 6 with the annular seal 8 spacing apart the closure

6 and the wall 2 around the opening 8. The sleeve 10 is welded to the closure 6 and receives a spigot 11 welded to the wall 2. The closure 6 thus pivots about the spigot 11 between a position (as shown) in which the closure 6 closes the opening 4 and an open position (not shown) in which the closure 6 is pivoted away from the opening 4. Normally, the spring 12 biases the closure 6 against and under the retaining lugs 16. The spring 12 is maintained under torsion by virtue of its ends being held between abutments 18. The closure 6 may be opened by pulling on the cord 14 against the action of the spring 12, causing the closure 6 to escape the capture of the retaining lugs 16 and to be pulled away from the opening 4. When the opening 4 is open, liquid may flow directly into the vortex chamber thereby by-passing the normal inlet and destroying the swirl in the vortex chamber.

Figures 6, 7 and 8 show a combination of a gully 22 and vortex valve 20 similar to that shown in Figures 1 and 2. In the embodiment shown in Figures 6, 7 and 8, however, the vortex valve 20 has a cylindrical vortex chamber 24, rather than the conical chamber 44, as shown in Figures 1 and 2. The principle of operation of the combined gully and vortex valve 20 shown in Figures 1 and 2 is, nevertheless, substantially identical to the manner of operation of the valve 40 shown in Figures 1 and 2.

Claims

1. A vortex-valve (40) comprising a housing defining a vortex chamber (44), the housing having an inlet (46) through which liquid may enter the vortex chamber (44) in a manner to promote swirl within the vortex chamber (44) and an outlet (48) at one axial end of the vortex chamber (44), a wall (2) of the housing being provided with an opening normally closed by a closure (6), said closure (6) being operable between the closed position and an open position in which liquid may enter the vortex chamber (44) by-passing said inlet (46) ; characterized in that the closure (6) is operable between the closed position and the open position by means remote from the vortex-valve (40).

2. A vortex-valve (40) according to claim 1, wherein the closure (6) is held in the normally closed position by a spring (12) which tends to urge the closure (6) against a stop (16).

3. A combination of a gully (42) and a vortex-valve (40) as claimed in claim 1 or 2, wherein the gully (42) includes an outlet (30) and the outlet (48) of the vortex-valve (40) communicates with the outlet 30 of the gully (42).

4. A gully according to claim 3, wherein a cord (14) is attached to the closure (6), the cord (14) leading out of the gully (42) in which the valve (40) is situated, for remote opening of the closure (6).

5. A method of unblocking a blocked vortex-valve

valve in accordance with the first aspect of the present invention ;

Figure 4 is a view on the line IV-IV of Figure 3 ;

Figure 5 is a view on the line V-V of Figure 3 ;

Figure 6 is a plan view of another embodiment of a gully provided with a vortex valve ;

Figure 7 is a view on the line VII-VII of Figure 6 ; and

Figure 8 is a view on the line VIII-VIII of Figure 6.

Figures 1 and 2 show a vortex valve 40 in accordance with the present invention, in situ in a gully 42. The vortex valve 40 comprises a conical vortex chamber 44 having an inlet 46 and an outlet 48. The outlet 48 communicates with an outlet 30 of the gully. The end wall 2 of the valve 40 is provided with a by-pass mechanism of the type shown in Figures 3 to 5. Normally, the closure 6 is closed over the opening (not shown). A cord 14 attached to the closure 6 leads to a position remote from the vortex valve 40 and gully 42 where the opening and closing of the closure 6 can be controlled from an accessible position. Any water in the gully 42 enters the inlet 46 to the vortex chamber 44, passes through the vortex chamber and out of the outlet 48 thereof. During storm conditions, the rate of flow through the vortex valve 40 is sufficiently high to cause the liquid in the vortex chamber to swirl, which swirl will cause a braking effect on the flow of water through the valve 40. This will cause a build up of water in the gully 42. Thus, in storm conditions, the rate of flow of water out of the gully 42 is controlled. Should the vortex valve 40 become blocked during storm conditions, for example, by debris present in the gully which becomes trapped in the inlet 46 of valve 40, the water backs up in the gully 42 and, under extreme conditions, will flood out of the top of the gully 42. The vortex valve 40 may be unblocked by first pulling the cord 14 thereby moving the closure 6 to a position in which the opening is open. This permits water in the gully 42 to flow unimpeded through the vortex chamber 44 and out of the outlet 30, and the gully 42 soon drains. Once the gully 22 has drained, an operator can, if necessary, descend into the dry gully and unblock the vortex valve 40. Occasionally, however, it is not necessary for the vortex valve 40 to be cleaned manually as the action of the water flushing through the vortex chamber 44 may be sufficient to clean out the vortex valve.

In Figures 3, 4 and 5, a detail of a wall 2 of the housing of a vortex valve in accordance with the present invention is shown. The wall 2 shown is circular (Figure 1), and might, for instance, be the end wall of a vortex valve such as that shown in Figures 1 and 2. The wall 2 of the housing is provided with a combined opening 4 and closure member 6. Associated with the closure member 6 is an annular sealing member 8, a sleeve 10, a torsion spring 12, a cord 14 and retaining lugs 16. The opening 4 is normally closed by the closure 6 with the annular seal 8 spacing apart the closure

6 and the wall 2 around the opening 8. The sleeve 10 is welded to the closure 6 and receives a spigot 11 welded to the wall 2. The closure 6 thus pivots about the spigot 11 between a position (as shown) in which the closure 6 closes the opening 4 and an open position (not shown) in which the closure 6 is pivoted away from the opening 4. Normally, the spring 12 biases the closure 6 against and under the retaining lugs 16. The spring 12 is maintained under torsion by virtue of its ends being held between abutments 18. The closure 6 may be opened by pulling on the cord 14 against the action of the spring 12, causing the closure 6 to escape the capture of the retaining lugs 16 and to be pulled away from the opening 4. When the opening 4 is open, liquid may flow directly into the vortex chamber thereby by-passing the normal inlet and destroying the swirl in the vortex chamber.

Figures 6, 7 and 8 show a combination of a gully 22 and vortex valve 20 similar to that shown in Figures 1 and 2. In the embodiment shown in Figures 6, 7 and 8, however, the vortex valve 20 has a cylindrical vortex chamber 24, rather than the conical chamber 44, as shown in Figures 1 and 2. The principle of operation of the combined gully and vortex valve 20 shown in Figures 1 and 2 is, nevertheless, substantially identical to the manner of operation of the valve 40 shown in Figures 1 and 2.

Claims

1. A vortex-valve (40) comprising a housing defining a vortex chamber (44), the housing having an inlet (46) through which liquid may enter the vortex chamber (44) in a manner to promote swirl within the vortex chamber (44) and an outlet (48) at one axial end of the vortex chamber (44), a wall (2) of the housing being provided with an opening normally closed by a closure (6), said closure (6) being operable between the closed position and an open position in which liquid may enter the vortex chamber (44) by-passing said inlet (46) ; characterized in that the closure (6) is operable between the closed position and the open position by means remote from the vortex-valve (40).

2. A vortex-valve (40) according to claim 1, wherein the closure (6) is held in the normally closed position by a spring (12) which tends to urge the closure (6) against a stop (16).

3. A combination of a gully (42) and a vortex-valve (40) as claimed in claim 1 or 2, wherein the gully (42) includes an outlet (30) and the outlet (48) of the vortex-valve (40) communicates with the outlet 30 of the gully (42).

4. A gully according to claim 3, wherein a cord (14) is attached to the closure (6), the cord (14) leading out of the gully (42) in which the valve (40) is situated, for remote opening of the closure (6).

5. A method of unblocking a blocked vortex-valve



(40) situated at the outlet (30) of a flooded gully (42), said vortex-valve (40) comprising a housing defining a vortex chamber (44), the housing having an inlet (46) communicating with the gully (42) through which liquid may enter the vortex chamber (44) in a manner to promote swirl within the vortex chamber (44) and an outlet (48) at one axial end of the vortex chamber (44), a wall (2) of the housing being provided with an opening normally closed by a closure (6) and said closure (6) being operable between the closed position and an open position in which liquid may enter the vortex chamber (44) from the gully (42) by-passing the liquid inlet; said method comprising:

- (i) operating the closure (6) from the normally closed position to the open position by a means remote from the vortex-valve;
- (ii) permitting the flooded gully (42) to drain through the opening (48) in the housing and the gully outlet (30);
- (iii) removing any material blocking the vortex-valve (40); and
- (iv) returning the closure (6) to the closed position.

Ansprüche

1. Vortex-Ventil (40) mit einem eine Wirbelkammer (44) besitzenden Gehäuse, welches einen Einlaß (46) besitzt, über welchen Flüssigkeit in die Wirbelkammer (44) in solcher Weise eintreten kann, daß in der Wirbelkammer (44) eine Wirbelströmung entsteht, wobei das Gehäuse an einem axialen Ende der Wirbelkammer (44) einen Auslaß (48) besitzt, eine Wand (2) des Gehäuses mit einer normalerweise durch einen Verschuß (6) verschlossenen Öffnung versehen ist, und der Verschuß (6) zwischen der Schließstellung und einer Offenstellung betätigbar ist, in welcher Flüssigkeit unter Umgehung des Einlasses (46) in die Wirbelkammer (44) eintreten kann, dadurch gekennzeichnet, daß der Verschuß (6) zwischen der Schließstellung und der Offenstellung durch vom Vortex-Ventil (40) entfernte Einrichtungen betätigbar ist.

2. Vortex-Ventil (40) nach Anspruch 1, worin der Verschuß (6) in der normalerweise geschlossenen Stellung durch eine Feder (12) gehalten wird, welche den Verschuß (6) gegen einen Anschlag (16) drückt.

3. Kombination aus einem Sinkkasten (42) und einem Vortex-Ventil (40) der in Anspruch 1 und 2 beanspruchten Art, worin der Sinkkasten (42) einen Auslaß (30) besitzt und der Auslaß (48) des Vortex-Ventils (40) mit dem Auslaß (30) des Sinkkastens (42) in Verbindung steht.

4. Sinkkasten nach Anspruch 3, worin am Verschuß (6) eine Leine (14) befestigt ist und die Leine (14) aus dem Sinkkasten (42), in welchem das Ventil (40) gelegen ist, herausführt, um den Verschuß (6)

von einer entfernten Stelle aus zu öffnen.

5. Verfahren zum Freimachen eines verlegten Vortex-Ventils (40), welches am Auslaß (30) eines durchfluteten Sinkkastens (42) gelegen ist, wobei das Vortex-Ventil (40) ein eine Wirbelkammer (44) bildendes Gehäuse besitzt, wobei das Gehäuse einen mit dem Sinkkasten (42) in Verbindung stehenden Einlaß (46) besitzt, durch welchen hindurch Flüssigkeit in solcher Weise in die Wirbelkammer (44) eintreten kann, daß in der Wirbelkammer (44) eine Wirbelströmung entsteht, das Gehäuse an einem axialen Ende der Wirbelkammer (44) einen Auslaß (48) besitzt, eine Wand (2) des Gehäuses mit einer normalerweise durch einen Verschuß (6) verschlossenen Öffnung versehen ist und der Verschuß (6) zwischen der Schließstellung und einer Offenstellung bewegbar ist, in welcher Flüssigkeit aus dem Sinkkasten (42) unter Umgehung des Flüssigkeitseinlasses in die Wirbelkammer (44) eintreten kann, bei welchem Verfahren

- (i) der Verschuß (6) aus der normalerweise geschlossenen Stellung in die Offenstellung durch vom Vortex-Ventil entfernt gelegene Einrichtungen gebracht wird,
- (ii) der überflutete Sinkkasten (42) über die Öffnung (48) im Gehäuse und über den Sinkkasten-auslaß (30) leerlaufen gelassen wird,
- (iii) das Vortex-Ventil (40) blockierendes Material entfernt wird und
- (iv) der Verschuß (6) in die Schließstellung zurückgebracht wird.

Revendications

1. Une vanne à turbulence (40) comprenant un corps définissant une chambre de turbulence (44), le corps comportant une admission (46) par l'intermédiaire de laquelle du liquide peut pénétrer dans la chambre de turbulence de manière à créer un mouvement tourbillonnaire dans la chambre de turbulence (44), et comportant également un échappement ou sortie (48) à une extrémité axiale de la chambre de turbulence (44), une paroi (2) de la chambre étant aménagée avec une ouverture normalement fermée par une obturation (6), la dite obturation (6) pouvant être manoeuvrée entre la position fermée et une position ouverte dans laquelle du liquide peut pénétrer dans la chambre de turbulence (44) en contournant la dite admission (46), le dispositif étant caractérisé en ce que l'obturation (6) peut être manoeuvrée entre la position fermée et la position ouverte à l'aide d'un moyen prévu à distance de la vanne à turbulence (40).

2. Une vanne à turbulence selon la revendication 1, dans laquelle l'obturation (6) est maintenue dans la position normalement fermée au moyen d'un ressort (12) ayant tendance à pousser l'obturation (6) contre une butée (16).



3. Une combinaison d'une goulotte (42) et d'une vanne à turbulence (40) comme revendiquée dans la revendication 1 ou 2, dans laquelle la goulotte (42) comprend une sortie (30), la sortie (48) de la vanne à turbulence (40) communiquant avec la sortie (30) de la goulotte (42). 5

4. Une goulotte selon la revendication 3, dans laquelle un cordon (14) est fixé à l'obturation (6), le cordon (14) étant prévu avec départ à partir de la goulotte (42) dans laquelle la vanne (40) est située, en vue de l'ouverture à distance de l'obturation (6). 10

5. Une méthode de débouchage d'une vanne à turbulence bouchée (40) située à la sortie (30) d'une goulotte submergée (42), la dite vanne à turbulence (40) comprenant un corps définissant une chambre de turbulence (44), le corps comportant une admission (46) communiquant avec la goulotte (42), le liquide pouvant pénétrer dans la chambre à turbulence (44) par l'intermédiaire de cette admission de manière à créer un mouvement tourbillonnaire à l'intérieur de la chambre de turbulence (44), la dite vanne comportant également une sortie (48) à une extrémité axiale de la chambre de turbulence (44), une paroi (2) du corps étant aménagée avec une ouverture normalement fermée par une obturation (6) et la dite obturation (6) pouvant être manoeuvrée entre la position fermée et une position d'ouverture dans laquelle du liquide peut pénétrer dans la chambre de turbulence (44) à partir de la goulotte (42) en contournant l'admission pour le liquide, la dite méthode comprenant : 15
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- (i) la manoeuvre de l'obturation (6) de la position normalement fermée à la position ouverte à l'aide d'un moyen prévu à distance de la vanne à turbulence ; 35
 - (ii) la faculté pour la goulotte submergée (42) de s'évacuer dans le corps, par la sortie de goulotte (30) et par l'ouverture (48) ;
 - (iii) l'enlèvement de toutes matières bloquant ou bouchant la vanne à turbulence ; et 40
 - (iv) le rappel de l'obturation (6) sur la position fermée. 45
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