[0042] As seen in FIG. 3, the sensing bore 230 includes an insert portion 310 and a threaded portion 320. Likewise, the vein 130 includes a shank portion 330 and a threaded portion 340. As can be seen, the vein 130 defines a bore 350 extending from a shank end 360 of the vein 130 to a thread end 370 of the vein 130 such that the bore 350 is continuous along the entire length of the vein 130. The vein 130 is shown with its threaded portion 340 engaging the threaded portion 320 of the sensing bore 230. This interaction secures the vein 130 in place and seals an interior surface 380 of the vein 130 from an exterior surface 390. Although the vein 130 and the sensing bore 230 are cylindrical in the current embodiment, these shapes should not be considered limiting on the scope of the disclosure.

[0043] As seen, the vein 130 extends nearly the entire length of the sensing bore 230. Although some unengaged threads are shown along the threaded portion 320, the vein 130 is designed to extend as far as possible into the sensing bore 230. The vein 130 is made of brass, stainless steel, copper, plastic, or any other type of material subject to low corrosion in an aqueous environment. Typically, the body 110 and the bonnet 120 are made of cast iron, although other similar materials may be used in various embodiments. Because cast iron can be highly corrosive when exposed to water, the extension of the vein 130 into the sensing bore 230 prevents corrosion, pitting, and tuberculation from degrading the ability of fluid to t1ow through the sensing bore 230. Typically, the body 110 will have a protective coating, but, in some circumstances, such a protective coating may not be applied easily to the interior of the sensing bore 230. However, in some embodiments, no vein 130 will be needed to prevent corrosion because a protective coating may be applied inside the sensing bore 230. In some embodiments, the vein 130 or another vein may be used but may not need to be extended along the entire length of the sensing bore 230.

[0044] As seen in FIGs. 1-3, the sensing bore 230 is generally cylindrical although the notch 140 is not. The notch 140 includes a portion that is semi-cylindrical, but the remainder of the notch 140 extends to the outermost extent 257. This configuration of the notch 140 allows for easier assembly of the bonnet 120 onto the body 110 if the vein 130 is already in place. For example, in some embodiments, the vein 130 may be prefabricated with the body 110 or may be preassembled with the body 110 as provided. For another example, in some embodiments, the subassembly l00 may need to be serviced or the bonnet 120 may need to be replaced due to cracking or other failure. Gate valves are designed in sizes ranging from a few inches (2.54 cm) to several feet (30.48 cm) in diameter. Particularly in embodiments with larger diameters, the bonnet 120 may be extremely heavy. Some gate valves are as large as 48-inches (122 cm) in diameter, and 24-inch (61 cm) diameter gate valves each include a bonnet weighing approximately 5,000 pounds (2,268 kg) . As such, attempting to align the vein 130 with a bore in the bonnet 120 may be very difficult. The notch 140 allows a user assembling the subassembly 100 to place the bonnet 120 onto the body 110 and then slide the bonnet 120 into place with the notch 140 aligned to the vein 130 and the

[0051] When in use, each gate valve 1000,1000' operates as its main function to allow a user selectively to prevent or to allow water flow through the fluid bore 145. Moving the encapsulated disc 710, the gate valve 1000, 1000' can be sealed when the contact surface 715 is seated against the valve seat 215. Actuation of the stem 810 moves the encapsulated disc 710 out of the flow path of fluid, thereby opening the flow.

[0052] When the vein 130 is included, as in gate valve 1000, the sensing bore 230 and the bore 350 of the vein 130 provide a fluid pathway in fluid communication with the interior 210 of the body 110. Because fluid in a piping system is under pressure, fluid is forced through the fluid pathway, and pressure equalizes with the pressure inside the gate valve 1000. As such, a pressure sensor may be placed on the shank end 360 of the vein 130 to sense pressure within the piping system.

[0053] In other embodiments, other types of sensors may be connected to the vein 130 to sense other aspects of fluid in the system, including (particularly when the fluid is water) turbidity, chlorination, and acidity (pH), among others. In the current embodiment, the vein 130 allows sensors to be placed outside of the gate valve 1000, thereby providing a non-intrusive means of measuring aspects of the fluid in the piping system. However, some sensors may be placed proximate the thread end 370 of the vein 130 or, in some embodiments, may protrude inside the fluid bore 145. In particular, MEMS (microelectromechanical systems) sensors may be especially adapted for the small spaces of the bore 350.

[0054] It is common for gate valves such as gate valve 1000 to be buried six feet (1.83 m) or more below the surface of the earth. In some embodiments, sensors such as the pressure sensor may be read electronically and may include wires leading to the surface. In some embodiments, the wires may be connected to a remote communicator such as an RF device. In some embodiments, the RF device will correspond with a mesh network. In those embodiments, it may be possible for the mesh network to measure pressure along different points in the piping system, thereby making easier determination of where leaks, blockages, or other failures in the piping systems may occur. Gate valve 1000' may be provided as a sensor-capable gate valve, such that the vein 130 is not included with the assembly but may be added by the user.

[0055] Another embodiment of a gate valve 2000 is shown and described with reference to FIG. 18. The gate valve 2000 includes the bonnet 120, the body 110, a stem 2810, and a top cover 2110, among other parts and features. As can be seen, the actuation bore 725 extends entirely through the encapsulated disc 710. When the gate valve 2000 is in an open position, the actuation bore 725 is in fluid communication with the interior of the body 110 and with fluid passing therethrough. As such, the actuation bore 725 can be used as testing port.

[0065] In some conditions, the gate valve 2000 may be changed to a closed position. When the gate valve 2000 is in the closed position, the actuation bore 725 is not in fluid communication with the interior of the gate valve 2000. However, the gate valve 2000 should be in the closed position only when maintenance or faults are determined in the piping system, and, as such, use of the sensing mechanism may not be required when the gate valve 2000 is in the closed position. In other embodiments, the gate 710 may include a sensing bore (not shown) to communicate fluid from one side of the gate 710 into the actuation bore 725 and maintain the ability to test at least one part of the piping system when the gate valve 2000 is in the closed position.

[0066] It should be emphasized that the embodiments described herein are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the present disclosure. Many variations and modifications may be made to the described embodiment(s) without departing substantially from the ~~spirit and principles of the~~ present disclosure. Further, the scope of the present disclosure is intended to cover any and all combinations and sub-combinations of all elements, features, and aspects discussed above. All such modifications and variations are intended to be included herein within the scope of the present disclosure, and all possible claims to individual aspects or combinations of elements or steps arc intended to be supported by the present disclosure.

[0067] One should note that conditional language, such as, among others, "can," "could", "might", or "may", unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while alternative embodiments do not include, certain features, elements and/or steps. Thus, such conditional language is not generally intended to imply that features, elements and/or steps are in any way required for one or more particular embodiments or that one or more particular embodiments necessarily include logic for deciding, with or without user input or prompting, whether these features, elements and/or steps are included or are to be performed in any particular embodiment.

[0068] Various implementations described in the present disclosure may include additional systems, methods, features, and advantages, which may not necessarily be expressly disclosed herein but will be apparent to one of ordinary skill in the art upon examination of the following detailed description and accompanying drawings. It is intended that all such systems, methods, features, and advantages be included within the present disclosure and protected by the accompanying claims.

CLAIMS

1. A gate valve comprising:
a body; ~~and~~
a sensing bore defined in the gate valve,
a bonnet; and a notch relief defined in the bonnet, wherein the sensing bore is accessible through the notch relief of the bonnet.

2. The gate valve of claim 1, wherein the sensing bore is defined in the body.

3. The gate valve of claim 2, wherein the sensing bore is defined in webbing of the body.

4. The gate valve of claim 2, wherein the sensing bore is defined proximate an inlet end of the body.

~~5. The gate valve of claim 1, further comprising a bonnet, wherein a notch relief is defined in the bonnet.~~

~~6. The gate valve of claim 5, wherein the sensing bore is accessible through the notch relief of the bonnet.~~

~~7.~~5. The gate valve of claim 1, further comprising a vein,
wherein a diameter of the vein is about equal to a diameter of the sensing bore.

~~8.~~6. The gate valve of claim ~~7~~ 5, wherein the sensing bore includes threading and wherein the vein includes threading to mate with the threading of the sensing bore.

~~9.~~7. The gate valve of claim ~~7~~ 5, further comprising a bonnet, wherein the vein extends through the bonnet.

~~10.~~8. The gate valve of claim 1, further comprising a plug, the plug including threading to mate with threading of the sensing bore.

~~11.~~9. A subassembly comprising:

a body, the body defining a sensing bore;

a bonnet contacting the body; and

~~at least one of a vein and a plug in the sensing bore,~~

a notch relief defined in the bonnet, wherein the sensing bore is accessible through the notch relief of the bonnet.

~~10.~~10. The subassembly of claim ~~11~~ 9, wherein the sensing bore is defined in webbing of the body.

~~13.~~11. The subassembly of claim ~~11~~ 9, further comprising a gate and a stem.

~~14.~~12. The subassembly of claim ~~11~~ 9, comprising at least one of a vein and a plug in the sensing bore, where the sensing bore includes threading to mate with at least one of the vein and the plug.

~~15.~~13. The subassembly of claim ~~11~~ 9, comprising a vein in the sensing bore, wherein the vein includes an end, wherein a sensor may be mounted to the end.

~~16.~~14. The subassembly of claim ~~11~~ 9, comprising a vein in the sensing bore, wherein the vein extends through a notch relief in the bonnet.

~~17.~~15. A method of sensing an aspect of a water control system, the method comprising:

gaining access to the water control system through an access bore in a gate valve;

at least temporarily removing water for testing from the access bore; and

sensing an aspect of the removed water, wherein gaining access to the water control system comprises accessing the access bore through a notch relief that is defined in a bonnet of the gate valve.

~~18.~~16. The method of claim ~~17~~ 15, wherein the sensed aspect includes at least one of pressure, turbidity, chlorination, and acidity.

~~19.~~17. The method of claim ~~17~~ 15, wherein the access bore is defined in a body of the gate valve.

~~20.~~18. The method of claim ~~17~~ 16, wherein gaining access to the water control system through an access bore in the gate valve includes gaining access to the water control system through a vein extending through the access bore.

~~21. A gate valve comprising:~~

~~a body;~~

~~a stem; and~~

~~a sensing bore defined in the stem.~~

~~22. The gate valve of claim 21, thither comprising a top cover, wherein the top cover defines an adapter bore.~~

~~23. The gate valve of claim 22, wherein the adapter bore is in fluid communication with the sensing bore of the stem.~~

~~24. The gate valve of claim 22, further comprising a bushing positioned between the stem and the top cover, the bushing defining at least one radial bore and a bushing annulus.~~

~~25. The gate valve of claim 24, wherein the sensing bore includes an axial portion and a radial portion.~~

~~26. The gate valve of claim 25, wherein the stem defines a shaft annulus such that the sensing bore, the shaft annulus, the radial bore, the bushing annulus, and the adapter bore define a flow path.~~

~~27. The gate valve of claim 21, further comprising a gate, the gate defining an actuation bore, the stem interacting with the actuation bore.~~

~~28. The gate valve of claim 27, wherein the actuation bore is in fluid communication with the sensing bore.~~

~~29. The gate valve of claim 28, wherein the actuation bore is in fluid communication with a fluid bore defined in the body of the gate valve when the gate is in an open position.~~

~~30. The gate valve of claim 27, wherein the gate is an encapsulated disc.~~

~~31. The gate valve of claim 21, further comprising a bonnet contacting the body.~~

~~32. The gate valve of claim 21, further comprising at least one of a vein and a plug in the sensing bore.~~

~~33. The gate valve of claim 32, wherein the vein is in the sensing bore, the vein including a bore, the bore allowing measurement of fluid inside the gate valve.~~

~~34. A method of sensing an aspect of a water control system, the method comprising:~~

~~gaining access to the water control system through a sensing bore defined in a stem of a gate valve;~~

~~at least temporarily removing water for testing from the sensing bore; and~~

~~sensing an aspect of the removed water.~~

~~35. The method of claim 34, wherein the sensed aspect includes at least one of pressure, turbidity, chlorination, and acidity.~~

~~36. The method of claim 34, wherein the sensing bore includes an axial portion and a radial portion.~~

~~37. The method of claim 36, wherein at least temporarily removing water for testing from the sensing bore includes removing water through an adapter bore defined in a top cover of the gate valve.~~

~~38. The method of claim 37, wherein a bushing is positioned between the top cover and the stem, the bushing defining at least one radial bore in fluid communication with the sensing bore and with the adapter bore.~~