

SENSOR FIXING STRUCTURE

TECHNICAL FIELD

The present application relates to the technical field of pipeline sensors, and further relates to a sensor fixing structure.

BACKGROUND

In the prior art, a pipeline is often used to transport fluid substances such as liquid or gas. To ensure the normal operation of equipment, different types of sensors can be used to measure parameters such as temperature, pressure, concentration, or flow rate of the fluid in the pipeline.

Chinese Patent Application No. 201210479628.5 discloses a method and device for measuring the temperature of a fluid medium in a small pipe. A temperature measuring element (sensor) is mounted on an adapter, and the adapter is connected in series between two small pipes, allowing the temperature probe of the temperature measuring element to be located at the center of the fluid, thereby improving the accuracy of temperature measurement.

However, the patent application document described above does not disclose the fixing mode of the temperature measuring element (sensor) and the adapter, and the fixing mode of the temperature measuring element (sensor) and the adapter directly affects the sealing performance of the overall structure of a pipeline temperature measuring device. In particular, when a pipeline transports high-temperature and high-pressure fluid, the pressure in the pipeline increases, the risk of sealing failure of the pipeline temperature measuring device increases, and the risk of fluid leakage is even greater.

In summary, the present application aims to provide a sensor fixing structure with high sealing performance.

SUMMARY

In view of the above technical problems, an objective of the present application

is to provide a sensor fixing structure with high sealing performance.

To achieve the above objective, the present application provides a sensor fixing structure for fixing a sensor at an interface of a chamber and allowing a sensing end of the sensor to be located in the chamber to measure a fluid parameter in the chamber. The sensor fixing structure comprises: a fastener, detachably mounted at the interface; a fixing member, provided with a first through hole extending in the length direction of the sensor; and a sealing portion, for sealing the sensing end and sealing the gap between the sensor and the first through hole. Wherein, when the sensor fixing structure is assembled, the fixing member and the fastener are sequentially assembled at the interface, the sensor penetrates and is fixed in the first through hole, the sensing end is located in the chamber, and the fixing member is compressed under the preload force of the fastener to form a seal with the interface and the fastener.

Compared with the prior art, the present invention has the following beneficial effects: for one aspect, in the above solution, the fixing member forms a seal with the interface and the fastener under the preload force of the fastener, thereby improving the sealing effect among the fixing member, the interface, and the fastener; for another aspect, in the above solution, the gap between the sensor and the first through hole is sealed via the sealing portion, thereby improving the sealing effect between the fixing member and the sensor. Through the two aspects mentioned above, the sensor fixing structure exhibits high overall sealing performance.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and performance of the present application are further described by the following embodiments and the accompanying drawings of the embodiments.

The above features, technical features, advantages, and embodiments of the present application will be further described below in a clear and easy-to-understand manner with reference to the accompanying drawings and preferred embodiments.

FIG. 1 is a perspective view of a sensor fixing structure according to an embodiment of the present application;

FIG. 2 is a sectional view of FIG. 1 taken along plane f;

FIG. 3 is a partial enlarged view of area a in FIG. 2;

FIG. 4 is a partial enlarged view of area b in FIG. 2;

FIG. 5 is an assembly structural schematic view of a fixing member, a sealing portion, and a sensor according to an embodiment of the present application;

FIG. 6 is a front view of FIG. 5;

FIG. 7 is a full sectional view of FIG. 6;

FIG. 8 is a sectional view of a sensor fixing structure according to another embodiment of the present application;

FIG. 9 is a partial enlarged view of area c in FIG. 8;

FIG. 10 is an assembly structural schematic view of a fixing member, a sealing portion, and a sensor according to another embodiment of the present application;

FIG. 11 is a full sectional view of FIG. 10;

FIG. 12 is a partial enlarged view of area e in FIG. 11;

FIG. 13 is a structural schematic view of FIG. 8 with the sealing portion and the sensor removed;

FIG. 14 is a partial enlarged view of area d in FIG. 13.

EMBODIMENTS OF THE PRESENT APPLICATION

To further clarify the embodiments of the present application or the technical solutions in the prior art, the specific embodiments of the present application will be described below with reference to accompanying drawings. Obviously, the accompanying drawings in the following description are only some embodiments of the present application, and for those of ordinary skill in the art, other accompanying drawings and other embodiments can be obtained according to these accompanying drawings without making creative efforts.

To simplify the drawings, only the parts related to the application are schematically shown in each drawing, and the parts do not represent the actual structure of the product. In addition, for the sake of conciseness and easy understanding of the drawings, in some drawings, only one of the components with the same structure or function is schematically shown, or only one of the components is marked. In this document, "one" not only means "only one," but also can mean the situation of "more than one."

In this document, it should be noted that unless otherwise explicitly specified and defined, the terms "mount," "interconnect," and "connect" should be understood in a broad sense. For example, the connection can be a fixed connection, a detachable connection, or an integral connection; the connection can be a mechanical connection or an electrical connection; the connection can be a direct connection, an indirect connection through an intermediate medium, or an internal communication between two elements. For those of ordinary skill in the art, the specific meanings of the above terms in the present application can be understood according to specific situations.

In addition, in the description of the present application, the terms "first," "second," and the like are only used for distinguishing description, and cannot be understood as indicating or implying relative importance.

The present application discloses a sensor fixing structure 100 for fixing a sensor 200 at an interface 330 of a chamber 340 and allowing a sensing end 210 of the sensor 200 to be located in the chamber 340 to measure a fluid parameter in the chamber 340.

As shown in FIGS. 1 and 2, the sensor fixing structure 100 is described by taking an example where the sensor fixing structure 100 fixes the sensor 200 at the interface 330 of a multi-way pipe 300. The above multi-way pipe 300 is of a hollow structure (that is, the chamber 340 is formed inside the multi-way pipe 300), and includes a first pipeline interface 310, a second pipeline interface 320, and the interface 330 which are interconnected with each other. The first pipeline interface 310 and the second pipeline interface 320 are used for connecting two adjacent pipelines, allowing the chamber 340 to be filled with fluid. The interface 330 is used for mounting the sensing end 210 of the sensor 200 in the chamber 340 of the multi-way pipe 300 via the sensor fixing structure 100. The above sensor 200 includes, but is not limited to, a temperature sensor,

a hydraulic sensor, and a pneumatic sensor.

Specifically, the sensor fixing structure 100 comprises: a fastener 110, a fixing member 120, and a sealing portion 130. Wherein, as shown in FIGS. 2 and 3, the fastener 110 is detachably mounted at the interface 330. The fixing member 120 is provided with a first through hole 123 extending in the length direction t of the sensor 200, and the length of the first through hole 123 is shorter than the length of the sensor 200. The sealing portion 130 is used for sealing the sensing end 210 of the sensor 200 and sealing a gap $S2$ between the sensor 200 and the first through hole 123. When the sensor fixing structure is assembled, the fixing member 120 and the fastener 110 are sequentially assembled at the interface 330, the sensing end 210 is located in the chamber 340, and the fixing member 120 is compressed under the preload force of the fastener 110 to form a seal with the interface 330 and the fastener 110.

In this embodiment, for one thing, the cooperation among the fastener 110, the fixing member 120, and the interface 330 improves the sealing performance among the fixing member 120, the interface 330, and the fastener 110; for another, the sealing of the gap $S2$ between the sensor 200 and the first through hole 123 by the sealing portion 130 improves the sealing performance between the sensor 200 and the fixing member 120. Through the above two aspects, this embodiment ensures the overall sealing effect of the sensor fixing structure 100 during the fixing of the sensor 200.

In addition, in this embodiment, the sensor 200 penetrates and is fixed in the first through hole 123 in the length direction t of the sensor 200, allowing the sensor 200 and the fixing member 120 to be relatively fixed; the fixing member 120 and the fastener 110 are sequentially assembled at the interface 330, allowing the fixing member 120 and the interface 330 to be relatively fixed, thereby allowing the sensor 200 and the interface 330 to be relatively fixed. In practical application, the depth of the sensor 200 extending into the chamber 340 can be accurately controlled by adjusting the position where the sensor 200 penetrates and is fixed in the first through hole 123. Therefore, the sensor fixing structure 100 can prevent the sensor 200 from extending excessively into the chamber 340, which can otherwise reduce the actual flow area of the fluid in the chamber 340 and thus affect the flow rate of the fluid passing through the chamber 340, and also prevent the sensor 200 from extending insufficiently into the chamber 340, which can otherwise result in insufficient contact

between the sensing end 210 and the fluid and thus affect the measurement accuracy of the sensor 200 on the fluid in the chamber 340.

Preferably, as shown in FIG. 2, the sealing portion 130 includes a sleeve 131 and a weld layer 132. The sleeve 131 is provided with a sealing end 1312 located in the chamber 340, the sealing end 1312 is used for accommodating the sensing end 210, the wall of the sleeve 131 is arranged in the gap S2, and the weld layer 132 is located between the port of the first through hole 123 and the sleeve 131. In this embodiment, first, the sleeve 131 is used to convert the sealing problem of the gap S2 between the sensor 200 and the first through hole 123 into the sealing problem between the sleeve 131 and the first through hole 123, and then the sealing between the sleeve 131 and the first through hole 123 is completed via the weld layer 132, allowing the sealing portion 130 to seal the gap S2 between the sensor 200 and the first through hole 123.

Specifically, the attachment position of the weld layer 132 includes the connection portion between the end of the first through hole 123 close to the chamber 340 and the sleeve 131 shown in FIG. 4, and the connection portion between the end of the first through hole 123 away from the chamber 340 and the sleeve 131 shown in FIG. 3, and the weld layer 132 annularly surrounds the outer surface of the sleeve 131.

In addition, in this embodiment, the fastener 110 is preferably a Perfluoroalkoxy (PFA) plastic part, the fixing member 120 is preferably a Polytetrafluoroethylene (PTFE) plastic part, the sleeve 131 is preferably a PFA pipe, and the weld layer 132 is preferably a PFA weld layer.

Preferably, as shown in FIGS. 5 and 6, the fixing member 120 includes a force-receiving portion 121 and an insertion portion 122 in the above length direction t. A force-receiving surface 1211 matched with the fastener 110 is provided at the end of the force-receiving portion 121 away from the insertion portion 122, and the insertion portion 122 and the interface 330 are provided with a mating sealing structure. Wherein, the force-receiving surface 1211 is used for receiving the above preload force to compress the sealing structure, thereby forming a seal between the fixing member 120 and the interface 330.

Specifically, the above sealing structure includes: an outer taper surface 1222

provided on the side wall of the insertion portion 122 and an inner taper surface 351 provided on the inner wall of the interface (as shown in FIG. 3). In the assembled state, the outer taper surface 1222 and the inner taper surface 351 are matched with each other for forming a seal between the fixing member 120 and the interface 330.

In addition, to further improve the sealing effect between the fixing member 120 and the interface 330, the sealing structure further includes an annular boss and an annular groove formed on the opposing sides of the insertion portion 122 and the interface 330, and the annular boss and the annular groove are matched with each other for forming a seal between the fixing member 120 and the interface 330. Specifically, as shown in FIG. 7, an annular groove 1223 and an annular boss 1224 are arranged on the side of the insertion portion 122 away from the force-receiving portion 121, and the annular groove 1223 and the annular boss 1224 are sequentially arranged around the first through hole 123 from inside to outside. As shown in FIG. 4, an annular boss 352 and an annular groove 353 are arranged on the side of the interface 330 facing the insertion portion 122, the annular boss 352 is matched with the annular groove 1223, and the annular groove 353 is matched with the annular boss 1224.

Preferably, with reference again to FIGS. 6 and 7, the fixing member 120 further includes an extension portion 124, and the above extension portion 124 is located on the side of the force-receiving portion 121 away from the insertion portion 122. Wherein, the diameter of the force-receiving portion 121 is configured to be greater than the diameter of the extension portion 124 and the diameter of the insertion portion 122, and the above force-receiving surface 1211 is equivalent to an annular surface on the side of the force-receiving portion 121 facing the extension portion 124.

Specifically, with reference again to FIGS. 2 and 3, the structure of the fastener 110 is adapted to the fixing member 120. The fastener 110 includes a limiting section 112 and a connecting section 113 sequentially connected in the above length direction t , and a second through hole 111 penetrating the limiting section 112 and the connecting section 113. The second through hole 111 located in the limiting section 112 has a first inner diameter $d1$ matched with the outer diameter of the extension portion 124, the second through hole 111 located in the connecting section 113 has a second inner diameter $d2$ matched with the outer diameter of the interface 330, and the above first inner diameter $d1$ is smaller than the second inner diameter $d2$. In the assembled state,

the insertion portion 122 is disposed in the interface 330, the force-receiving portion 121 is located between the connecting section 113 and the interface 330, the extension portion 124 is located in the second through hole 111 of the limiting section 112, and the outer wall of the interface 330 is detachably connected to the inner wall of the second through hole 111 of the connecting section 113. The connection mode of the above interface 330 and the connecting section 113 includes, but is not limited to, threaded connection and interference fit connection.

FIGS. 8 and 9 show another embodiment of the sensor fixing structure 100 of the present application. In this embodiment, the sealing portion 130 only includes the sleeve 131, one end of the sleeve 131 located in the chamber 340 is sealed for accommodating the sensing end 210, and the other end of the sleeve 131 extends towards the fixing member 120 in the above length direction t and wraps the outer surface of the fixing member 120.

Specifically, as shown in FIGS. 10, 11, and 12, the sensor 200 penetrates and is fixed in the first through hole 123 in the length direction t of the sensor 200. Specifically, in the above length direction t , a portion of the sensor 200 (including the sensing end 210) is located on the side of the fixing member 120 close to the chamber 340, and the other portion of the sensor 200 is located on the side of the fixing member 120 away from the chamber 340. Since the sleeve 131 wraps both the fixing member 120 and the sensor 200 located on the side of the fixing member 120 close to the chamber 340, the gap S2 between the sensor 200 and the first through hole 123 is isolated from the chamber 340, thereby indirectly achieving the effect of sealing the gap S2 between the sensor 200 and the first through hole 123.

Preferably, the fixing member 120 is of a spherical structure. As shown in FIGS. 9, 13, and 14, hemispherical cavities S1 and S3 matched with the fixing member 120 are respectively formed on the opposing sides of the fastener 110 and the interface 330, which are used for compressing the sleeve 131 wrapped on the outer surface of the fixing member 120 under the action of the above preload force, allowing the fixing member 120 to form a seal with the fastener 110 and the interface 330, respectively. With reference again to FIG. 9, in the assembled state, the fastener 110 compresses the fixing member 120, and the fixing member 120 and the sleeve 131 wrapped on the surface of the fixing member 120 are both located in the hemispherical cavities S1 and

S3, allowing the sleeve 131 on the surface of the fixing member 120 to form a seal with the interface 330 and the fastener 110.

In addition, in this embodiment, the fastener 110 is preferably a PFA plastic part, the fixing member 120 is preferably a steel use stainless (SUS) part, and the sleeve 131 is preferably a PFA pipe.

It should be noted that a pipe cap 1311 is arranged at the end of the sleeve 131 away from the chamber 340 in the embodiment shown in FIGS. 1 and 2, which is used for relatively fixing the sensor 200 in the sleeve 131. While in this embodiment, the gap between the sensor 200 and the first through hole 123 is partially filled with resin 133 (as shown in FIG. 12) to relatively fix the sensor 200 in the sleeve 131.

Preferably, as shown in FIG. 14, the fastener 110 includes the limiting section 112 and the connecting section 113 sequentially connected in the above length direction t , and the second through hole 111 penetrating the limiting section 112 and the connecting section 113. The second through hole 111 located in the limiting section 112 has a first inner diameter $d3$, the second through hole 111 located in the connecting section 113 has a second inner diameter $d4$ matched with the outer diameter of the interface 330, and the above first inner diameter $d3$ is smaller than the second inner diameter $d4$. The hemispherical cavities S1 and S3 are located on the opposing sides of the second through hole 111 where the limiting section 112 is located and the interface 330. It should be noted that the first inner diameter $d3$ in FIG. 14 and the first inner diameter $d1$ shown in FIG. 3 are both used for representing the diameter of the second through hole 111 in the limiting section 112, and both the first inner diameters $d1$ and $d3$ described above are no smaller than the outer diameter of the sensor 200 to allow the sensor 200 to pass through; the second inner diameter $d4$ in FIG. 14 and the second inner diameter $d2$ shown in FIG. 3 are both used for representing the diameter of the second through hole 111 in the connecting section 113.

With reference again to FIG. 9, in the assembled state, the fixing member 120 and the sleeve 131 wrapped on the surface of the fixing member 120 are clamped in the hemispherical cavities S1 and S3 of the interface 330 and the limiting section 112, and the outer wall of the interface 330 is detachably connected to the inner wall of the second through hole 111 of the connecting section 113. The connection mode of the

above interface 330 and the connecting section 113 includes, but is not limited to, threaded connection and interference fit connection.

It should be noted that the above embodiments can be freely combined as required. The above are merely preferred embodiments of the present invention, and for those of ordinary skill in the technical field, a number of improvements and modifications can be made without departing from the principle of the present invention, and these improvements and modifications should also be regarded as falling within the protection scope of the present invention.

What is claimed is:

1. A sensor fixing structure, for fixing a sensor at an interface of a chamber, and allowing a sensing end of the sensor to be located in the chamber to measure a fluid parameter in the chamber, comprising:

a fastener, detachably mounted at the interface;

a fixing member, provided with a first through hole extending in the length direction of the sensor;

a sealing portion, for sealing the sensing end, and sealing a gap between the sensor and the first through hole;

wherein, when the sensor fixing structure is assembled, the fixing member and the fastener are sequentially assembled at the interface, the sensor penetrates and is fixed in the first through hole, the sensing end is located in the chamber, and the fixing member is compressed under the preload force of the fastener to form a seal with the interface and the fastener.

2. The sensor fixing structure according to claim 1, wherein the sealing portion includes a sleeve and a weld layer, the sleeve is provided with a sealing end located in the chamber, the sealing end is used for accommodating the sensing end, and the wall of the sleeve is arranged in the gap; the weld layer is located between the first through hole and the sleeve, for sealing a gap between the first through hole and the sleeve.

3. The sensor fixing structure according to claim 2, wherein the weld layer is attached to the connection portion between the end of the first through hole close to the chamber and the sleeve, and/or the weld layer is attached to the connection portion between the end of the first through hole away from the chamber and the sleeve.

4. The sensor fixing structure according to claim 1, wherein the fixing member includes a force-receiving portion and an insertion portion in the length direction of the fixing member, a force-receiving surface matched with the fastener is formed at the end of the force-receiving portion away from the insertion portion, and the insertion portion and the interface are provided with a mating sealing structure; the force-

receiving surface is used for receiving the preload force to compress the sealing structure, thereby forming a seal between the fixing member and the interface.

5. The sensor fixing structure according to claim 4, wherein the sealing structure includes: an outer taper surface provided on the side wall of the insertion portion and an inner taper surface provided on the inner wall of the interface, and the outer taper surface and the inner taper surface are matched with each other, for forming a seal between the fixing member and the interface.

6. The sensor fixing structure according to claim 4, wherein the sealing structure includes: an annular boss and an annular groove formed on the opposing sides of the insertion portion and the interface, and the annular boss and the annular groove are matched with each other, for forming a seal between the fixing member and the interface.

7. The sensor fixing structure according to claim 4, wherein the fastener includes a limiting section and a connecting section sequentially connected in the length direction, and a second through hole penetrating the limiting section and the connecting section, the second through hole in the limiting section has a first inner diameter allowing the sensor to pass through, the second through hole in the connecting section has a second inner diameter matched with the outer diameter of the interface, and the first inner diameter is smaller than the second inner diameter.

8. The sensor fixing structure according to claim 7, wherein the fixing member further includes an extension portion, the extension portion is located on the side of the force-receiving portion away from the insertion portion, the diameter of the force-receiving portion is configured to be greater than the diameter of the extension portion and the diameter of the insertion portion, the force-receiving surface is configured to be an annular surface on the side of the force-receiving portion facing the extension portion, and the first inner diameter of the second through hole is matched with the outer diameter of the extension portion.

9. The sensor fixing structure according to claim 1, wherein the sealing portion includes a sleeve, the sleeve is provided with a sealing end located in the chamber, the sealing end is used for accommodating the sensing end, and the other end of the sleeve

wraps the outer surface of the fixing member.

10. The sensor fixing structure according to claim 9, wherein the fixing member is of a spherical structure, hemispherical cavities are formed on the opposing sides of the fastener and the interface, respectively, and the hemispherical cavities are adapted to the spherical structure, and used for compressing the sleeve wrapped on the outer surface of the fixing member under the action of the preload force, allowing the fixing member to form a seal with the fastener and the interface, respectively.