

SENSOR FIXTURE

TECHNICAL FIELD

[0001]

5 The present invention relates to a sensor fixture which fixes a sensor to a variety of valves, steam traps, or circular cylindrical parts or polygonal parts of piping, etc.

BACKGROUND ART

10 [0002]

 Some conventional sensor fixtures fix a sensor to a rotary shaft. The conventional sensor fixtures include a long band for being wound around the rotary shaft, and a stopper metal fitting provided with a ratchet mechanism into which the band is inserted. Thus, the sensor can be fixed to the rotary shaft of any diameter, from small one to large one, with one fixture (for
15 example, refer to Patent Document 1).

[0003]

 These sensor fixtures may not firmly fix the sensor since the long band is used.

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[Reference Document of Conventional Art]

Patent Document:

[0004]

Patent Document 1: JPU1987-082407A

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DISCLOSURE OF THE INVENTION

[Problems to be Solved by the Invention]

[0005]

Embodiments of the present invention seek to provide a sensor fixture
5 which can fix a sensor easily and firmly without using a band.

[Summary of the Invention]

[0006]

In order to solve the problem, a sensor fixture according to the present
10 invention is to be attached to a sensor attaching part. The sensor fixture includes
a clamp body, two clamp arms, and a fixing bolt. The clamp body includes a
sensor fixing portion for fixing a sensor so that a tip end of the sensor contacts the
sensor attaching part, and two pivot coupling parts for pivotably coupling the
clamp arms to the clamp body at left and right positions with respect to the sensor
15 fixing portion, respectively. Each of the two clamp arms includes a protrusion, the
protrusions contacting the sensor attaching part at laterally symmetrical positions
when the two clamp arms pinch the sensor attaching part from the left and right.
The fixing bolt includes a fastening part for coupling and fastening the two clamp
arms below the protrusions.

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[Effects of the Invention]

[0007]

According to embodiments of the present disclosure, a sensor can be
fixed easily and firmly.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is an elevational view illustrating one example of a sensor
5 fixture according to a first embodiment of the present invention.

Fig. 2 is a left side view illustrating one example of the sensor fixture
according to the first embodiment of the present invention.

Fig. 3 is an elevational view illustrating one example of a sensor
fixture according to one modification of the present invention.

10 Fig. 4 is an elevational view illustrating one example of a sensor
fixture according to another modification of the present invention.

MODES FOR CARRYING OUT THE INVENTION

[0009]

15 Hereinafter, one desirable embodiment of a sensor fixture according to
the present invention will be described with reference to the accompanying
drawings. Note that in the following description, a case where a long and
narrow cylindrical tip part of a sensor is fixed to a pipe having an annular
cross section in a contacting manner will be illustrated to describe the present
20 invention. Note that dimensions of constituent members illustrated in each
drawing are not intended to scale actual dimensions of the constituent
members.

[0010]

[First Embodiment]

25 Fig. 1 is an elevational view illustrating one example of the sensor

fixture according to a first embodiment of the present invention. Fig. 2 is a left side view illustrating one example of the sensor fixture according to the first embodiment of the present invention.

[0011]

5 As illustrated in Fig. 1, the sensor fixture 100 includes a clamp body 1, clamp arms 2 and 3 which are respectively attached to left and right sides of the clamp body 1, and a fixing bolt 15. The clamp arms 2 and 3 include protrusions 4 and 5, respectively.

[0012]

10 The clamp body 1 can be fabricated, for example, by cutting out aluminum or die casting aluminum. Each of the clamp arms 2 and 3 can be fabricated, for example, by laminating two sheets of thin stainless steel plate having about 1 to 5 mm thickness so as to be separated from each other. The clamp arms 2 and 3 are coupled to left and right ends of the clamp body 1,
15 respectively.

[0013]

A sensor fixing portion 8 for fixing a sensor 9 is formed near the center of the clamp body 1. The sensor fixing portion is formed, for example, by cutting female threads corresponding to the center of an upper portion of a
20 pipe (a sensor attaching part), and thus, can threadedly fix the sensor 9 on which male threads are cut.

[0014]

A locknut 10 for fixing the sensor 9 more surely to the clamp body 1 is provided to an upper end of the clamp body 1. Loosening of the sensor 9
25 from the sensor fixing portion 8 can be prevented by fastening the locknut 10.

[0015]

A tip end 12 of the sensor 9 constitutes a first supporting point against a pipe 11 by contacting an outer surface of the pipe 11 having the annular cross section. The sensor 9 can measure temperature, vibration, etc. of the pipe 11 by contacting the pipe 11. For example, the sensor 9 can measure the temperature of the pipe 11 at the contacting point by using a thermocouple. Further, for example, the sensor 9 can measure the vibration occurring at the pipe 11 by using a piezoelectric element.

[0016]

The two thin stainless steel plates which constitute the clamp arms 2 and 3, respectively, are pivotably coupled to the left and right ends of the clamp body 1 by using rivets 6 and 7 (pivot coupling parts), respectively. For example, in Fig. 1, the clamp arm 2 is coupled to the left end of the clamp body 1 in the figure by using the rivet 6, and the clamp arm 3 is coupled to the right end of the clamp body 1 in the figure by using the rivet 7.

[0017]

The clamp arms 2 and 3 have a substantially S-shape and are arranged laterally symmetrical. The clamp arm 2 is provided with the protrusion 4 formed somewhat below its longitudinal center, and the clamp arm 3 is provided with the protrusion 5 formed somewhat below its longitudinal center.

[0018]

For example, the clamp arm 2 includes a first curved portion 2a and a second curved portion 2b, and the protrusion 4 is formed in a curve connecting portion between the first curved portion 2a and second curved portion 2b. Further, for example, the clamp arm 3 includes a first curved portion 3a and a

second curved portion 3b, and the protrusion 5 is formed in a curve connecting portion between the first curved portion 3a and second curved portion 3b,

[0019]

5 The protrusions 4 and 5 have a shape of semicircle or semi-ellipse, and may be made of same material as the clamp arms 2 and 3 or different materials from the clamp arms 2 and 3. In this embodiment, the protrusions 4 and 5 are made of the same material as the clamp arms 2 and 3, and integrally formed by press forming.

[0020]

10 The protrusions 4 and 5 are disposed at laterally symmetrical positions with respect to the center of the pipe 11, where the protrusions 4 and 5 can contact outer circumference of the pipe 11 when the two clamp arms 2 and 3 pinch the pipe 11 from the left and right, respectively. Thus, the positions where thickened portions of the protrusions 4 and 5 contact the pipe 11
15 (contacting points of the circle) can constitute second and third supporting points against the pipe 11, respectively.

[0021]

By disposing the second and third supporting points on the circumference of the circle of the pipe 11 having the annular cross section, on
20 the other side of the first supporting point constituted by the tip end 12 of the sensor 9 so that the second and third supporting points are separated from each other, the sensor fixture 100 can be firmly fixed to the pipe 11. Note that central angles formed by the center of the circle of the pipe 11, and the first, second and third supporting points are preferred to be or be close to 120
25 degrees, respectively. Especially, the central angle formed by the center of

the circle of the pipe 11, and the second and third supporting points is preferred to be less than 180 degrees.

[0022]

Lubricant such as molybdenum disulfide is preferably applied to the
5 contacting portions between each of the protrusions 4 and 5 and the pipe 11 in order to facilitate sliding movement on the outer circumferential surface of the pipe 11. Further, although the protrusions 4 and 5 have the shape of semicircle or semi-ellipse as described above, other shapes such as a mountain shape or a gear tooth shape are also applicable.

10 [0023]

Side plates 13 and 14 are disposed at lower end portions of the clamp arms 2 and 3, respectively, contacting the two thin stainless steel plates in a substantially perpendicular manner. Each lower end portion is formed to have a channel shape in cross section when viewed from the protrusion 4 or 5.

15 [0024]

A through-hole is respectively formed to the two side plates 13 and 14 which are coupling parts, so that the fixing bolt 15 is attached to penetrate the clamp arms 2 and 3. A head 16 of the fixing bolt 15 at the left end thereof has a cone shape, and a spherical seat nut 17 is threadedly coupled to the right
20 end portion of the fixing bolt 15 in order to fasten the bolt.

[0025]

A left end 18 of the spherical seat nut 17 has a sphere shape, and thus, a contacting area between the side plate 14 and the spherical seat nut 17 can be larger than if a flat seat nut is used, when the spherical seat nut 17 is fastened
25 to the fixing bolt 15. Therefore, the clamp body 1 and the clamp arms 2 and

3 can surely be fixed to the pipe 11.

[0026]

Note that a so-called quick nut may be used as the spherical seat nut 17 to fasten the fixing bolt 15 in order to fix the pipe 11. Further, since the clamp arms 2 and 3 respectively include the first curved portions 2a and 3a as described above, the clamp arms 2 and 3 can fix the pipe 11 of various diameters. Furthermore, because the protrusions 4 and 5 can slide on the outer circumferential surface of the pipe 11, the clamp arms 2 and 3 can fasten the pipe 11 at suitable supporting positions when fixing the pipe 11.

10 [0027]

Note that, in the above description, one example of fixing the sensor fixture 100 to the pipe is illustrated; however, as an example other than the pipe, the sensor fixture 100 can also be fixed to a part having an annular cross section or a polygonal cross section, at an inlet or outlet of a variety of valves and steam traps.

[0028]

[Modifications]

Although the clamp body 1 is directly coupled to the clamp arms 2 and 3, respectively, in the above description, one or more extension arms may be attached between the clamp body 1 and each of the clamp arms 2 and 3.

20 [0029]

Figs. 3 and 4 are elevational views illustrating examples of sensor fixtures according to modifications of the present invention. Fig. 3 illustrates one example of the sensor fixture 101 in which first extension arms 21 and 31 are attached between the clamp body 1 and the clamp arms 2 and 3,

[0030]

Thus, the protrusions 4 and 5 can be disposed at suitable positions according to the diameter of the pipe 11 by attaching one or more extension arms between the clamp body 1 and the clamp arms 2 and 3, respectively, and thereby, the sensor fixture can be surely fixed.

10 INDUSTRIAL APPLICABILITY

[0031]

The present invention can be utilized as the sensor fixture which can fix the sensor easily and firmly to a variety of valves, steam traps, or circular cylindrical parts or polygonal parts of piping, etc.

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DESCRIPTION OF REFERENCE NUMERALS

[0032]

- | | |
|---------|-------------|
| 1 | Clamp Body |
| 2, 3 | Clamp Arm |
| 20 4, 5 | Protrusion |
| 9 | Sensor |
| 11 | Pipe |
| 15 | Fixing Bolt |

CLAIMS

1. A sensor fixture to be attached to a sensor attaching part, comprising:

- 5 a clamp body;
 two clamp arms; and
 a fixing bolt,

 wherein the clamp body includes a sensor fixing portion for fixing a sensor so that a tip end of the sensor contacts the sensor attaching part, and
10 two pivot coupling parts for pivotably coupling the clamp arms to the clamp body at left and right positions with respect to the sensor fixing portion, respectively,

 wherein each of the two clamp arms includes a protrusion, the protrusions contacting the sensor attaching part at laterally symmetrical
15 positions when the two clamp arms pinch the sensor attaching part from the left and right, and

 wherein the fixing bolt includes a fastening part for coupling and fastening the two clamp arms below the protrusions.

20 2. The sensor fixture of claim 1, wherein the sensor fixing portion is formed near the center of the clamp body.

 3. The sensor fixture of claim 1 or 2, wherein the sensor attaching part is a pipe having an annular cross section, and the sensor measures one of
25 temperature and vibration of the pipe at an outer surface thereof.

4. The sensor fixture of any one of claims 1 to 3, wherein the sensor contacts the pipe at a position above the center of the circle of the pipe in the cross section, and the protrusions contact the pipe below the center of the circle of the pipe in the cross section.

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5. The sensor fixture of any one of claims 1 to 4, wherein the two clamp arms have a substantially S-shape and are arranged laterally symmetrical, and each of the protrusions is disposed between two curved portions constituting the S-shape.

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6. The sensor fixture of any one of claims 1 to 5, wherein two sheets of opposing side plate are attached to end portions of the two clamp arms on the other side of the sensor fixing portion, respectively, and the fastening part couples and fastens the two clamp arms by fastening a spherical seat nut to the fixing bolt penetrating the side plates.

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7. The sensor fixture of claim 6, wherein the spherical seat nut constituting the fastening part is a quick nut.

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8. The sensor fixture of any one of claims 1 to 7, wherein each of the two clamp arms includes a plurality of arm members.

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9. The sensor fixture of any one of claims 1 to 8, wherein each of the two clamp arms includes two sheets of thin plate, and the protrusion has one of a semicircle shape and a semi-ellipse shape, and is integrally formed with the clamp arm.