

DESCRIPTION

TITLE OF THE INVENTION: APPARATUS FOR TESTING AND EVALUATING PIPE JOINT

TECHNICAL FIELD

[0001] The present invention relates to an apparatus for testing and evaluating a joint portion of a pipe, and more particularly to an apparatus for testing and evaluating sealing property at a joint portion of a pipe, which can be suitable used for testing and evaluating a joint portion of a pipe which is used in, for example, an oil refinery plant, a petrochemical plant and the like.

BACKGROUND ART

[0002] In general, deformation of a pipe, such as bending, extension or shrinkage is sometimes caused by a force, heat and the like which are applied from the outside of the pipe. When the deformation or the like is caused in the pipe, there is a possibility that fastening of a pipe is not uniformly carried out, or a space is generated at a joint portion of pipes due to bending of the pipe, and that sealing property is lowered at a joint portion due to lowering of a fastening load at the joint portion.

[0003] Conventionally, as an apparatus for determining a position of two flanges based on the results obtained by determining a position of the flanges when pipes are connected with each other through the flanges in which one flange is provided at a pipe, and other flange has holes of which position has not yet been comprehended, there has been proposed an apparatus for determining a position of a flange for use in producing a pipe having a flange, which has two rotatable tables each having a rotatable shaft of which one end is connected with a face plate as main constituents, in which those rotatable shafts are positioned so that

an angle and a distance of the rotatable shafts are fixable in an arbitrary value, a distance from intersection of those axes and a common perpendicular to the face plate is fixably controlled to arbitrary value, and the angular position of the rotatable shaft is positioned so that the angular position is fixable in an arbitrary position (see, for example, Patent Literature 1).

[0004] According to the above-mentioned apparatus for determining a position of flanges, although a relative position of the flanges can be confirmed when a pipe is connected with two flanges which are provided at pipes, properties such as sealing property at the joint portion of the pipe cannot be evaluated.

[0005] Therefore, in recent years, there has been desired to develop an apparatus for testing and evaluating a joint portion of a pipe, which enables easily testing or evaluating properties such as sealing property at the joint portion of a pipe.

PRIOR ART LITERATURE

PATENT LITERATURE

[0006] Patent Literature 1: Japanese Patent Unexamined Publication No. Hei 5-34137

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007] The present invention has been made in view of the above-mentioned prior art. An object of the present invention is to provide an apparatus for testing and evaluating a joint portion of a pipe, which enables easily testing or evaluating properties such as sealing property at the joint portion of a pipe.

MEANS FOR SOLVING THE PROBLEMS

[0008] The present invention relates to an apparatus for testing and evaluating

a joint portion of two pipes, which is used in testing or evaluating a property at a joint portion of the pipes, which includes at least one stage selected from a stage for moving a pipe in a horizontal direction, which includes a fixing portion for rotatably positioning one end of a pipe out of the pipes which are connected with each other through a joint portion, and a unit for moving a pipe in a horizontal direction about the fixing portion as a fulcrum, and a stage for moving in a longitudinal-horizontal direction, which includes a unit for moving another pipe out of the pipes in a longitudinal direction and/or a horizontal direction.

EFFECTS OF THE INVENTION

[0009] The apparatus for testing and evaluating a joint portion of a pipe according to the present invention shows excellent effects such that properties such as sealing property at a joint portion of a pipe can be easily tested or evaluated.

BRIEF DESCRIPTION OF DRAWINGS

[0010] Fig. 1 is a schematic front view showing one embodiment of an apparatus for testing and evaluating a joint portion of a pipe according to the present invention.

Fig. 2 is a schematic plan view showing one embodiment of an apparatus for testing and evaluating a joint portion of a pipe according to the present invention.

Fig. 3 is a schematic front view showing another embodiment of an apparatus for testing and evaluating a joint portion of a pipe according to the present invention.

MODE FOR CARRYING OUT THE INVENTION

[0011] As described above, the apparatus for testing and evaluating a joint portion of a pipe according to the present invention includes at least one stage selected from a stage for moving in a horizontal direction, which includes a fixing portion for rotatably positioning one end of a pipe out of the pipes which are connected with each other through a joint portion, and a unit for moving a pipe in a horizontal direction about the fixing portion as a fulcrum; and a stage for moving in a longitudinal-horizontal direction, which includes a unit for moving another pipe out of the pipes in a longitudinal direction and/or a horizontal direction.

[0012] Hereinafter, the apparatus for testing and evaluating a joint portion of a pipe according to the present invention will be explained with reference to drawings. However, the present invention is not limited only to those embodiments described in the drawings.

[0013] Fig. 1 is a schematic front view showing one embodiment of an apparatus for testing and evaluating a joint portion of a pipe according to the present invention. Fig. 2 is a schematic plan view showing one embodiment of an apparatus for testing and evaluating a joint portion of a pipe according to the present invention.

[0014] In Fig. 1 and Fig. 2, one end portion of a pipe 1 is connected with one end portion of a pipe 2 through a joint portion 3. As the joint portion 3, a flange has been generally used. Each of Fig. 1 and Fig. 2 shows an embodiment in which a flange (not shown in the figure) is used as the joint portion 3. When the flange is used as the joint portion 3, the flange (not shown in the figure) of the pipe 1 is connected with the flange (not shown in the figure) of the pipe 2 through a seal member (not shown in the figure), and the flanges are fixed by a fastening jig 3a such as a bolt.

[0015] The other end portion 1a of the pipe 1 is connected with a fixing portion 4 for rotatably fixing the end portion 1a. The end portion 1a of the pipe 1 can be

connected with the fixing portion 4 by, for example, providing a mounting portion 1b having a hole (not shown in the figure), to which the fixing portion 4 can be inserted, at the end portion 1a of the pipe 1, and inserting the fixing portion 4 into the hole formed in the mounting portion 1b so that the pipe 1 is rotatable about the fixing portion 4 as a fulcrum.

[0016] In the embodiment shown in Fig. 1 and Fig. 2, one end of the mounting portion 1b is attached to the end portion 1a of the pipe 1 so that the end portion 1a of the pipe 1 is sealed. However, in the present invention, one end of the mounting portion 1b is not necessarily attached to the end portion 1a so that the end portion 1a of the pipe 1 is sealed.

[0017] The fixing portion 4 is fixed to a stage 5 for moving in a horizontal direction. The stage 5 for moving in a horizontal direction is equipped with a unit 6 for moving in a horizontal direction for moving the pipe 1 in a horizontal direction about the fixing portion 4 as a fulcrum as shown by an arrow A in Fig. 2. The unit 6 for moving in a horizontal direction includes, for example, a moving unit which includes a screw portion 6b on which a rotating handle 6a is mounted, and a screw engaging portion 7 which is threadedly engaged with the screw portion 6b, and is provided at the pipe 1, and the like, and the present invention is not limited only to the exemplified one. The pipe 1 can be freely moved in the direction shown by the arrow A in Fig. 2 by rotating the rotating handle 6a provided at the unit 6 for moving in a horizontal direction.

[0018] As shown in Fig. 1, the pipe 1 is connected through a gas conduit 8a with a pressurizing gas cylinder 8 for imparting a pressure to the inside of the pipe 1 and the pipe 2 which is connected with the pipe 1 through the joint portion 3. It is optional to provide the pipe 1 with the pressurizing gas cylinder 8 through the gas conduit 8a in the present invention. In the embodiment shown in Fig. 1, the pipe 1 is equipped with a pressure gauge 9 for measuring an internal pressure of the pipe 1. However, it is also optional that the pipe 1 is equipped with the

pressure gauge 9.

[0019] On the other hand, one end of the pipe 2 is connected with the pipe 1 through the joint portion 3. In the embodiment shown in Fig. 1, the other end 2a of the pipe 2 is sealed. However, the other end 2a of the pipe 2 is not necessarily sealed.

[0020] A unit 10 for moving in a longitudinal-horizontal direction for moving the pipe 2 in a longitudinal direction (axial direction) and/or a horizontal direction [a direction orthogonal to the longitudinal direction (axial direction) of the pipe 2] is provided at a stage 11 for moving in a horizontal direction.

[0021] The unit 10 for moving in a horizontal-horizontal direction is equipped with a unit 12 for moving the pipe 2 in a horizontal direction. The unit 12 for moving in a horizontal direction includes, for example, a unit for moving in a horizontal direction, which includes a screw portion 12b equipped with a rotating handle 12a, and a fixing portion 13 for threadedly engaging with the screw portion 12b and fixing the pipe 2 to the unit 10 for moving in a longitudinal-horizontal direction, and the like, and the present invention is not limited only to the exemplified one. In the unit 12 for moving in a horizontal direction shown in Fig. 1 and Fig. 2, the pipe 2 can be freely moved in the horizontal direction by rotating the rotating handle 12a.

[0022] In addition, the unit for moving in a longitudinal-horizontal direction is equipped with a unit 14 for moving the pipe 2 in the longitudinal direction (axial direction) of the pipe 2. The unit 14 for moving in a longitudinal direction includes, for example, a unit for moving in a longitudinal direction, which includes a screw portion 14b equipped with a rotating handle 14a, and a fixing portion 13 which is threadedly engaged with the screw portion 14b and provided at the pipe 2, and the like, and the present invention is not limited only to the exemplified one. In the unit 14 for moving in a longitudinal direction shown in Fig. 1 and Fig. 2, the pipe 2 can be freely moved in the longitudinal direction by

rotating the rotating handle 14a.

[0023] In the present invention, both of the unit for moving in a horizontal direction 12 and the unit 14 for moving in a longitudinal direction can be provided at the stage 11 for moving in a longitudinal-horizontal direction. Alternatively, any one of the unit 12 for moving in a horizontal direction and the unit 14 for moving in a longitudinal direction can be provided at the stage 11 for moving in a longitudinal-horizontal direction. Which one of the unit 12 for moving in a horizontal direction 12 and the unit 14 for moving in a longitudinal direction is provided at the stage 11 for moving in a longitudinal-horizontal direction can be appropriately determined depending on the kind of evaluating properties such as sealing property at the joint portion 3 between the pipe 1 and the pipe 2, a kind of the pipe 1 and the pipe 2, and the like. It is preferred that both of the unit 12 for moving in a horizontal direction 12 and the unit 14 for moving in a longitudinal direction are provided at the stage 11 for moving in a longitudinal-horizontal direction.

[0024] In addition, both of the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction can be provided at the apparatus for testing and evaluating a joint portion of a pipe of the present invention. Alternatively, any one of the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction can be provided at the apparatus. Which one of the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction is provided at the apparatus can be appropriately determined depending on the kind of evaluating properties such as sealing property at the joint portion 3 between the pipe 1 and the pipe 2, a kind of the pipe 1 and the pipe 2, and the like, and it is preferred that both of the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction are provided in the apparatus.

[0025] In the apparatus for testing and evaluating a joint portion of a pipe shown in Fig. 1 and Fig. 2, the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction are separately provided in the apparatus, respectively. However, both of them can be connected with each other. Incidentally, when the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction are separately provided in the apparatus, it is preferred that the stage 5 for moving in a horizontal direction and the stage 11 for moving in a longitudinal-horizontal direction are fixed on a floor (not shown in the figure) so that the stage 5 and the stage 11 would not be moved when the unit 6 for moving in a horizontal direction and the unit 10 for moving in a longitudinal in a horizontal direction are operated.

[0026] When the apparatus for testing and evaluating a joint portion of a pipe shown in Fig. 1 or Fig. 2 is used, it can be easily confirmed whether or not leakage of a pressurizing gas is generated at the joint portion 3 with the pressure gauge 9 by, for example, connecting the pipe 1 with the pipe 2 through the joint portion 3, fixing the pipe 1 and the pipe 2 with each other by the fastening jig 3a, sealing each end portion of the pipe 1 and the pipe 2, introducing a pressurizing gas from the pressurizing gas cylinder 8 through the gas conduit 8a to the pipe 1 and the pipe 2 to apply a pressure, and thereafter operating the unit 6 for moving in a horizontal direction provided at the stage 5 for moving in a horizontal direction, and the unit 10 for moving in a longitudinal-horizontal direction provided at the stage 11 for moving in a longitudinal-horizontal direction under the condition such that the pipe 1 and the pipe 2 are completely separated from the outside to form a closed system by means of a valve(not shown in the figure) which is provided at the gas conduit 8a. Thereby, properties such as sealing property at the joint portion 3 of the pipe 1 and the pipe 2 can be easily tested or evaluated, since leakage of a gas or a liquid from the pipe 1 or the pipe 2 can be

easily confirmed under what condition the pipe 1 and the pipe 2 are connected with the joint portion 3.

[0027] When the apparatus for testing and evaluating a joint portion of a pipe according to the present invention is used, properties such as sealing property at a joint portion of a pipe can be tested or evaluated, for example, in the following cases.

[0028] (1) A case where the pipe 1 and the pipe 2 are bent through the joint portion 3

After the pipe 1 is connected with the pipe 2 through the joint portion 3 so that an axis of the pipe 1 is aligned with an axis of the pipe 2, the rotating handle 6a provided at the unit 6 for moving in a horizontal direction and the rotating handle 12a provided at the unit 12 for moving in a horizontal direction are rotated. Thereby, a bending angle between the pipe 1 and the pipe 2 at which leakage of a gas or a liquid in the pipe 1 and the pipe 2 initiates can be examined by bending the pipe 1 and the pipe 2 through the joint portion 3.

[0029] (2) A case where misalignment is caused between the axis of the pipe 1 and the axis of the pipe 2 through the joint portion 3

After the pipe 1 is connected with the pipe 2 through the joint portion 3 so that an axis of the pipe 1 is aligned with an axis of the pipe 2, the rotating handle 12a provided at the unit 12 for moving in a horizontal direction is rotated, to cause a so-called misalignment which means that the axis of the pipe 1 is not aligned with the axis of the pipe 2, and a state of misalignment when leakage of a gas or a liquid in the pipe 1 and the pipe 2 initiates can be examined.

[0030] (3) A case where a gap is generated at the joint portion 3 interposed between the pipe 1 and the pipe 2

After the pipe 1 is connected with the pipe 2 through the joint portion 3 so that an axis of the pipe 1 is aligned with an axis of the pipe 2, the rotating handle 14a provided at the unit 14 for moving in a longitudinal direction is rotated, to

separate the pipe 2 from the pipe 1, and a state of a gap generated at the joint portion 3 can be examined when leakage of a gas or a liquid in the pipe 1 and the pipe 2 initiates from the joint portion 3.

[0031] As described above, when the apparatus for testing and evaluating a joint portion of a pipe according to the present invention is used, a state of the joint portion 3 can be easily confirmed when leakage of a gas or a liquid in the pipe 1 and the pipe 2 is generated from the joint portion 3 interposed between the pipe 1 and the pipe 2 by operating the unit 6 for moving in a horizontal direction provided at the stage 5 for moving in a horizontal direction and the unit 10 for moving in a longitudinal-horizontal direction provided at the stage 11 for moving in a longitudinal-horizontal direction.

[0032] Accordingly, when the apparatus for testing and evaluating a joint portion of a pipe according to the present invention is used, properties such as sealing property at the joint portion 3 between the pipe 1 and the pipe 2 can be easily tested or evaluated. Therefore, a degree at which leakage of a gas or a liquid in the pipe 1 and the pipe 2 is generated at the joint portion 3 by misalignment, inclination, a gap or the like can be easily previously confirmed before the pipe 1 is actually connected with the pipe 2 through the joint portion 3. In addition, when the apparatus for testing and evaluating a joint portion of a pipe according to the present invention is used, a pressure necessary for fastening the joint portion 3 to avoid leakage of a gas or a liquid from the pipe 1 and the pipe 2 can be easily confirmed. Furthermore, when the apparatus for testing and evaluating a joint portion of a pipe according to the present invention is used, various properties such as sealing property when misalignment, inclination or a gap is generated at the joint portion 3 also can be tested or evaluated by operating the unit 6 for moving in a horizontal direction provided at the stage 5 for moving in a horizontal direction and/or the unit 10 for moving in a horizontal direction provided at the stage 11 for moving in a longitudinal-

horizontal direction.

[0033] As mentioned above, according to the apparatus for testing and evaluating a joint portion of a pipe of the present invention, various properties such as sealing property can be confirmed when misalignment, inclination or a gap is generated at the joint portion 3. Therefore, the apparatus can be preferably used when property such as sealing property is tested or evaluated at a joint portion of pipes which are used in, for example, an oil refinery plant, a petrochemical plant and the like.

[0034] In addition, in the present invention, a vibration-generating apparatus 15 can be provided at the lower part of the stage 11 for moving in a longitudinal-horizontal direction, for example, as shown in Fig. 3. Incidentally, Fig. 3 is a schematic front view showing another embodiment of the apparatus for testing and evaluating a joint portion of a pipe according to the present invention.

[0035] When the vibration-generating apparatus 15 is provided at the lower part of the stage 11 for moving in a longitudinal-horizontal direction as shown in Fig. 3, there is an advantage that sealing property in vibration of the pipe 2, which is caused by, for example, earthquake or the like, that is, whether or not leakage of a gas or a liquid in the pipe 1 and the pipe 2 is caused by vibration at the joint portion 3 interposed between the pipe 1 and the pipe 2 can be easily evaluated.

[0036] The vibration-generating apparatus includes, for example, a compact vibration tester "Wave Maker" series, a standard vibration tester "SL" series, a large amplitude horizontal vibration tester "HVM" series, a multi-axis simultaneous vibration tester "WTS" series and the like, which are manufactured by ASAHI SEISAKUSHO Co. Ltd; general-purpose-use type vibration testers "i series", "J series", "K series", "VS series", "CV series" and the like, which are manufactured by Mitutoyo Corporation, and the like, and the present invention is not limited only to those exemplified ones.

[0037] The stage 11 for moving in a longitudinal-horizontal direction can be

directly connected with the vibration-generating apparatus 15. Alternatively, the stage 11 can be connected with the vibration-generating apparatus 15 through a connecting member 16 as shown in Fig. 3.

EXPLANATION OF REFERENTIAL NUMBERS

[0038] 1: Pipe

1a: End portion of pipe

1b: Mounting portion

2: Pipe

3: Joint portion

3a: Fastening jig

4: Fixing portion

5: Stage for moving in a horizontal direction

6: Unit for moving in a horizontal direction

6a: Rotating handle

6b: Screw portion

7: Screw engaging portion

8: Pressurizing gas cylinder

8a: Gas conduit

9: Pressure gauge

10: Unit for moving in a longitudinal- horizontal direction

11: Stage for moving in a longitudinal-horizontal direction

12: Unit for moving in a horizontal direction

12a: Rotating handle

12b: Screw portion

13: Fixing portion

14: Unit for moving in a longitudinal direction

14a: Rotating handle

15: Vibration-generating apparatus

16: Connecting member

CLAIMS

1. An apparatus for testing and evaluating a joint portion of two pipes, which is used in testing or evaluating a property at a joint portion of the pipes, comprising at least one stage selected from
a stage for moving a pipe in a horizontal direction comprising a fixing portion for rotatably positioning one end of a pipe out of the pipes which are connected with each other through a joint portion, and a unit for moving a pipe in a horizontal direction about the fixing portion as a fulcrum, and
a stage for moving in a longitudinal-horizontal direction comprising a unit for moving another pipe out of the pipes in a longitudinal direction and/or a horizontal direction.
2. The apparatus for testing and evaluating a joint portion of a pipe according to claim 1, which comprises both of the stage for moving a pipe in a horizontal direction and the stage for moving in a longitudinal-horizontal direction.
3. The apparatus for testing and evaluating a joint portion of a pipe according to claim 1 or 2, which comprises the stage for moving a longitudinal-horizontal direction, wherein a vibration generator system is provided at a lower part of the stage for moving a longitudinal-horizontal direction.