Accordingly, an object of the present invention is to enable accurate and simple diagnosis of an operation abnormality of a valve.

Solution to Problem

[0007a]

According to an aspect, the present disclosure refers to a valve capable of detecting an operation abnormality, the valve comprising: a valve main body including a flow path, through which a fluid flows, and a diaphragm; a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm; a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by pressing a central portion of the diaphragm during sliding in the one direction; a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor; an abnormality determination device determining a presence or absence of abnormality by comparing a change in a distance between the predetermined location and the position sensor at a time of abnormality

diagnosis detected by the position sensor, with a pre-measured change in a distance between the predetermined location and the position sensor at a time of normality; and a magnet attached to a predetermined location near the pressing adaptor, wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet, and the abnormality determination device determines a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a pre-measured change in a distance between the magnet and the magnetic sensor at the time of normality.

[0007b]

According to another aspect, the present disclosure refers to a method for diagnosing abnormality of a valve, the valve comprising a valve main body including a flow path, through which a fluid flows, and a diaphragm, a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm, a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by pressing a central portion of the diaphragm during sliding in the one

direction, a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor, and a magnet attached to a predetermined location near the pressing adaptor, wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet, and the method comprising determining a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a pre-measured change in a distance between the magnet and the magnetic sensor at a time of normality.

[0007c]

According to another aspect, the present disclosure refers to a computer-readable recording medium having recorded thereon a computer program for diagnosing abnormality of a valve, the valve comprising a valve main body including a flow path, through which a fluid flows, and a diaphragm, a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm, a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by

pressing a central portion of the diaphragm during sliding in the one direction, a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor, and a magnet attached to a predetermined location near the pressing adaptor, wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet, wherein by the computer program, a computer performs a process of determining a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a pre-measured change in a distance between the magnet and the magnetic sensor at a time of normality.

[0008]

A valve according to one example of the present disclosure is a valve capable of detecting an operation abnormality. The valve has: a stem that slides according to an opening/closing operation of the valve; a pressing adapter that presses a peripheral edge of a diaphragm; a position sensor that is attached to the pressing adapter and detects a change in the distance between a predetermined location of the stem and the position sensor;

and an abnormality determination mechanism that compares the change in the distance between the predetermined location and the position sensor at the time of abnormality diagnosis detected by the position sensor and a previously measured change in the distance between the predetermined location and the magnetic sensor at the time of normality, and determines whether or not there is an abnormality.

[0009]

The valve may further have a magnet that is attached to a predetermined location in the vicinity of the pressing

adapter. The position sensor may be composed of a magnetic sensor that is attached to a surface facing the stem, inside the pressing adapter, and detects a change in the distance between the magnet and the magnetic sensor, and the abnormality determination mechanism may compare the change in the distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor and a previously measured change in the distance between the magnet and the magnetic sensor at the time of normality, and may determine whether or not there is an abnormality.

[0010]

In addition, the abnormality determination mechanism may determine whether or not there is an abnormality, according to whether or not a position of a top surface or a bottom surface of the stem at the time of abnormality diagnosis is a position of the top surface or the bottom surface at the time of normality.

[0011]

Further, the abnormality determination mechanism may determine whether or not there is an abnormality, according to whether or not a stroke of the stem at the time of abnormality diagnosis is matched with a stroke at the time of normality.

[0012]

Moreover, the abnormality determination mechanism may determine whether or not there is an abnormality, according to whether or not an operating speed of the stem at the time of abnormality diagnosis is matched with an operating speed at the time of normality.

[0013]

Further, position detection accuracy of the position sensor may be ±0.01 mm to ±0.001 mm.

[0014]

An abnormality diagnosis method of a valve according to another example of the present disclosure is an abnormality diagnosis method of a valve including a stem that slides according to an opening/closing operation of the valve, a pressing adapter that presses a peripheral edge of a diaphragm, and a position sensor that is attached to the pressing adapter and detects a change in the distance between a predetermined location of the stem and the position sensor. The abnormality diagnosis method has a step of comparing the change in the distance between the predetermined location and the position sensor at the time of abnormality diagnosis detected by the position sensor and a previously measured change in the distance between the predetermined location and the position sensor at the time of normality, and determining whether or not there is an abnormality.

[0015]

A computer program according to another example of the present disclosure is a computer program for diagnosing an abnormality of a valve including a stem that slides according to an opening/closing operation of the valve, a pressing adapter that presses a peripheral edge of a diaphragm, and a position sensor that is attached to the pressing adapter and detects a change in the distance between a predetermined location of the stem and the position sensor. The computer program causes a computer to execute a process to compare the change in the distance between the predetermined location and the position sensor at the time of abnormality diagnosis detected by the position sensor and a previously measured change in the distance between the predetermined location and the position sensor at the time of normality, and determining whether or not there is an abnormality.

The computer program can be provided by being recorded on various computer program-readable recording media.

Advantageous Effects of Invention

[0016]

According to the present invention, an operation abnormality of a valve can be diagnosed accurately and

CLAIMS

1. A valve capable of detecting an operation abnormality, the valve comprising:

a valve main body including a flow path, through which a fluid flows, and a diaphragm;

a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm;

a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by pressing a central portion of the diaphragm during sliding in the one direction;

a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor;

an abnormality determination device determining a presence or absence of abnormality by comparing a change in a distance between the predetermined location and the position sensor at a time of abnormality diagnosis detected by the position sensor, with a pre-measured change in a distance between the predetermined location and the position sensor at a time of normality; and

a magnet attached to a predetermined location near the pressing adaptor,

wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet, and

the abnormality determination device determines a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a

pre-measured change in a distance between the magnet and the magnetic sensor at the time of normality.

2. The valve of claim 1, wherein the abnormality determination device determines a presence or absence of abnormality depending on whether a location of an upper surface or a lower surface of the stem at the time of abnormality diagnosis matches a location of the upper surface or the lower surface at the time of normality.

3. The valve of claim 1, wherein the abnormality determination device determines a presence or absence of abnormality depending on whether a stroke of the stem at the time of abnormality diagnosis matches a stroke at the time of normality.

4. The valve of claim 1, wherein the abnormality determination device determines a presence or absence of abnormality depending on whether an operating speed of the stem at the time of abnormality diagnosis matches an operating speed at the time of normality.

5. The valve of any one of claim 1, 2, 3, or 4, wherein a precision in detection of a position of the position sensor is ±0.01 mm to ±0.001 mm.

6. A method for diagnosing abnormality of a valve, the valve comprising a valve main body including a flow path, through which a fluid flows, and a diaphragm, a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm, a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by pressing

a central portion of the diaphragm during sliding in the one direction, a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor, and a magnet attached to a predetermined location near the pressing adaptor, wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet, and the method comprising determining a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a pre-measured change in a distance between the magnet and the magnetic sensor at a time of normality.

7. A computer-readable recording medium having recorded thereon a computer program for diagnosing abnormality of a valve, the valve comprising a valve main body including a flow path, through which a fluid flows, and a diaphragm, a pressing adaptor provided on the valve main body, and pressing a periphery of the diaphragm, a stem provided on the valve main body to be slidable in one direction and an opposite direction thereof with respect to the pressing adaptor, and blocking a flow of the fluid by pressing a central portion of the diaphragm during sliding in the one direction, a position sensor attached to the pressing adaptor, and detecting a change in a distance between a predetermined location of the stem and the position sensor, and a magnet attached to a predetermined location near the pressing adaptor, wherein the position sensor comprises a magnetic sensor that is attached to a surface opposite to the stem inside the pressing adaptor and detects a change in a distance from the magnet,

wherein by the computer program, a computer performs a

process of determining a presence or absence of abnormality by comparing a change in a distance between the magnet and the magnetic sensor at the time of abnormality diagnosis detected by the magnetic sensor, with a pre-measured change in a distance between the magnet and the magnetic sensor at a time of normality.