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(43) **Pub. Date: Aug. 25, 2005**(54) **APPARATUS FOR ABSORBING VIBRATION OF COMPRESSOR**(30) **Foreign Application Priority Data**

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Yong-Gu Kim, Suwon (KR); **Tae-Hee Lee**, Seoul (KR)**Publication Classification**(51) **Int. Cl.⁷** **F04B 17/00; F04B 35/00**(52) **U.S. Cl.** **417/363; 417/902**

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FALLS CHURCH, VA 22040-0747 (US)(21) Appl. No.: **10/917,446**(22) Filed: **Aug. 13, 2004**(57) **ABSTRACT**

An apparatus for absorbing vibration of a compressor includes: an elastic body mounted at an outer surface of a compressor case and elastically deformed when vibration is generated at a compressor; and a mass body connected to the elastic body, resonating with the compressor, for absorbing vibration of the compressor. Accordingly, vibration of the compressor is reduced so that noise and reliability degradation of a component due to the vibration can be reduced.

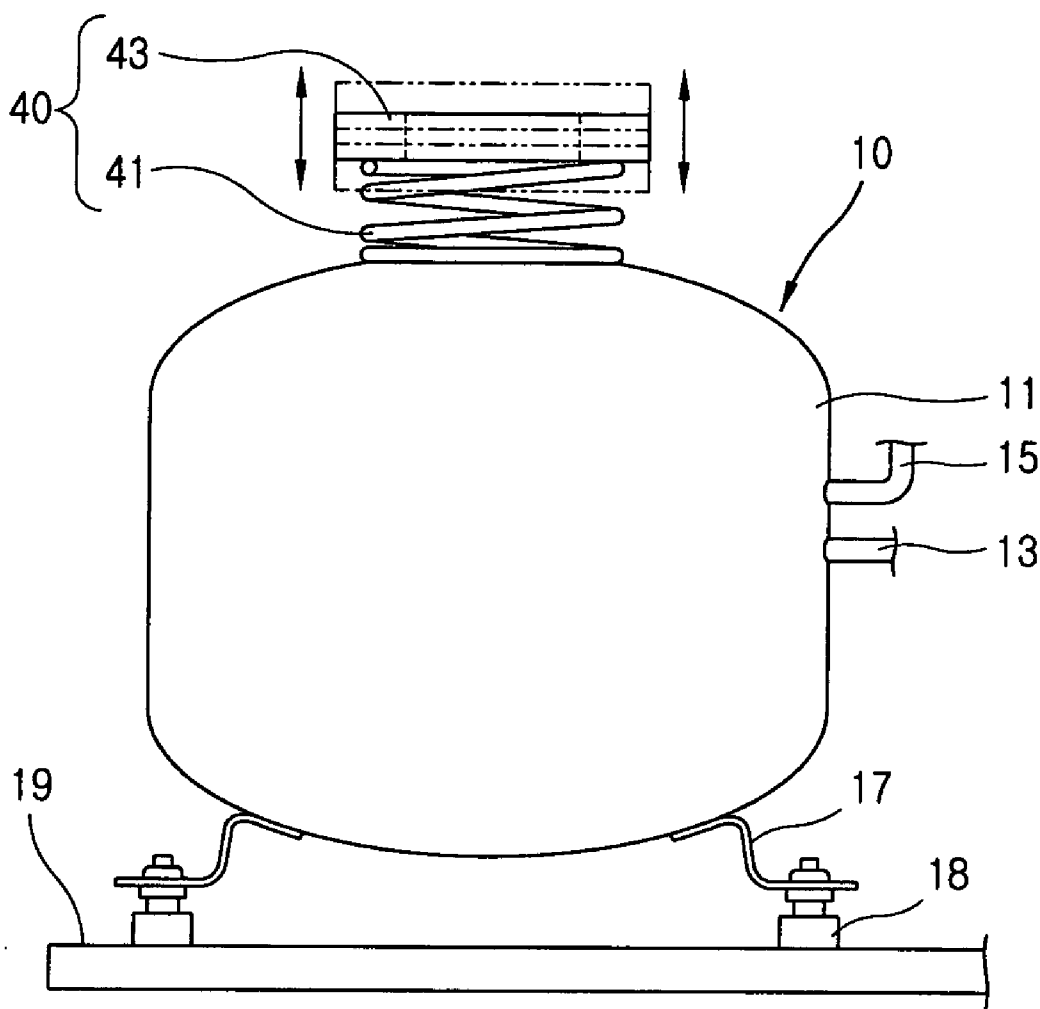


FIG. 1
CONVENTIONAL ART

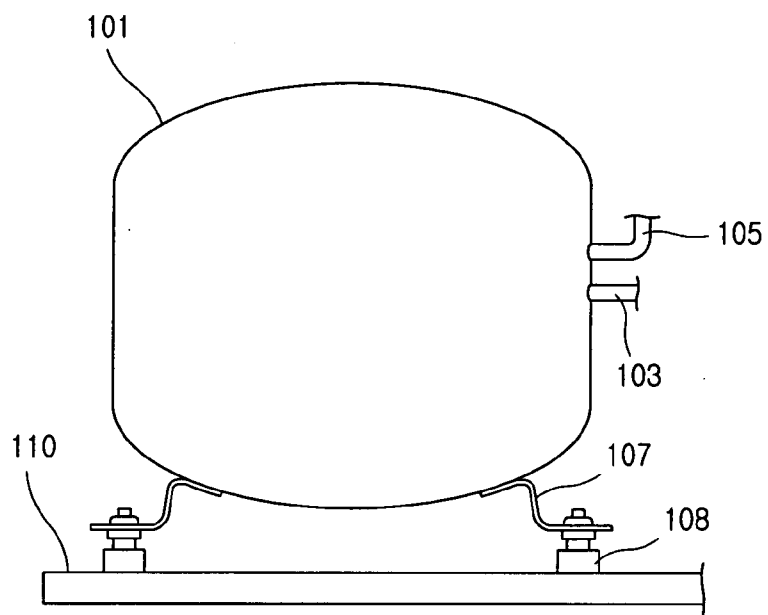


FIG. 2

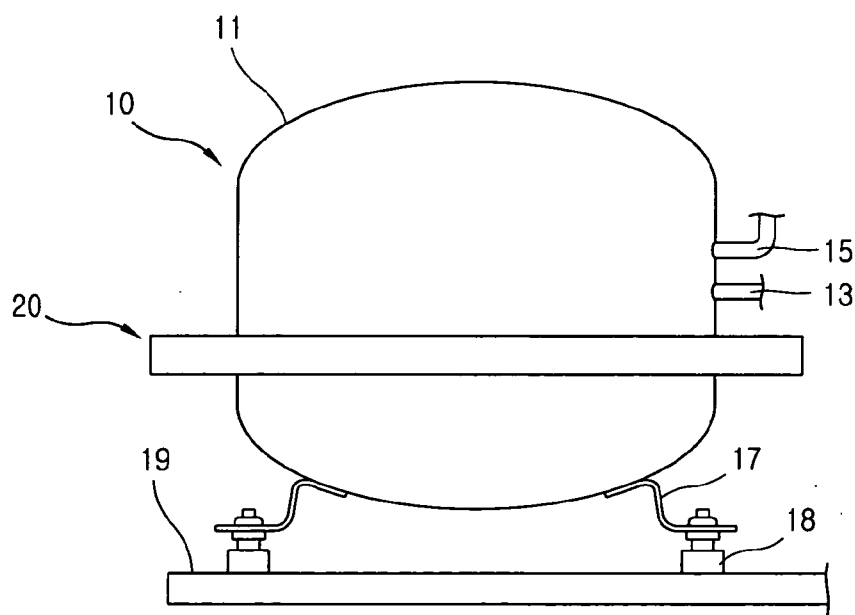


FIG. 3

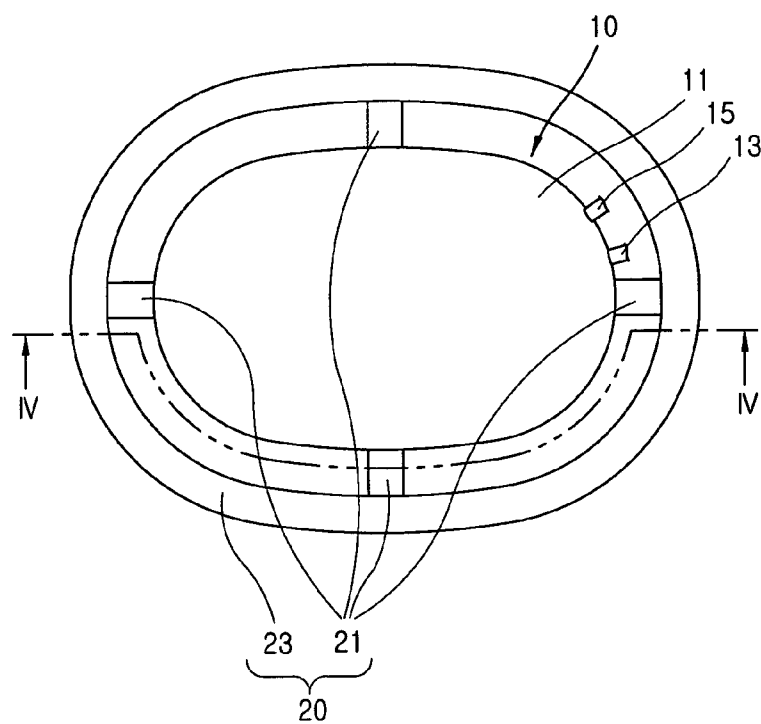


FIG. 4

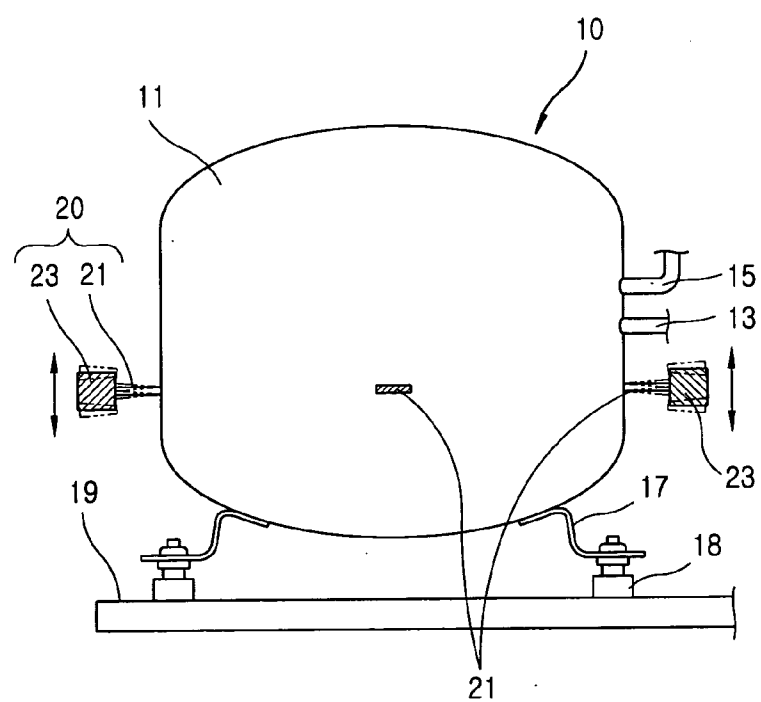


FIG. 5

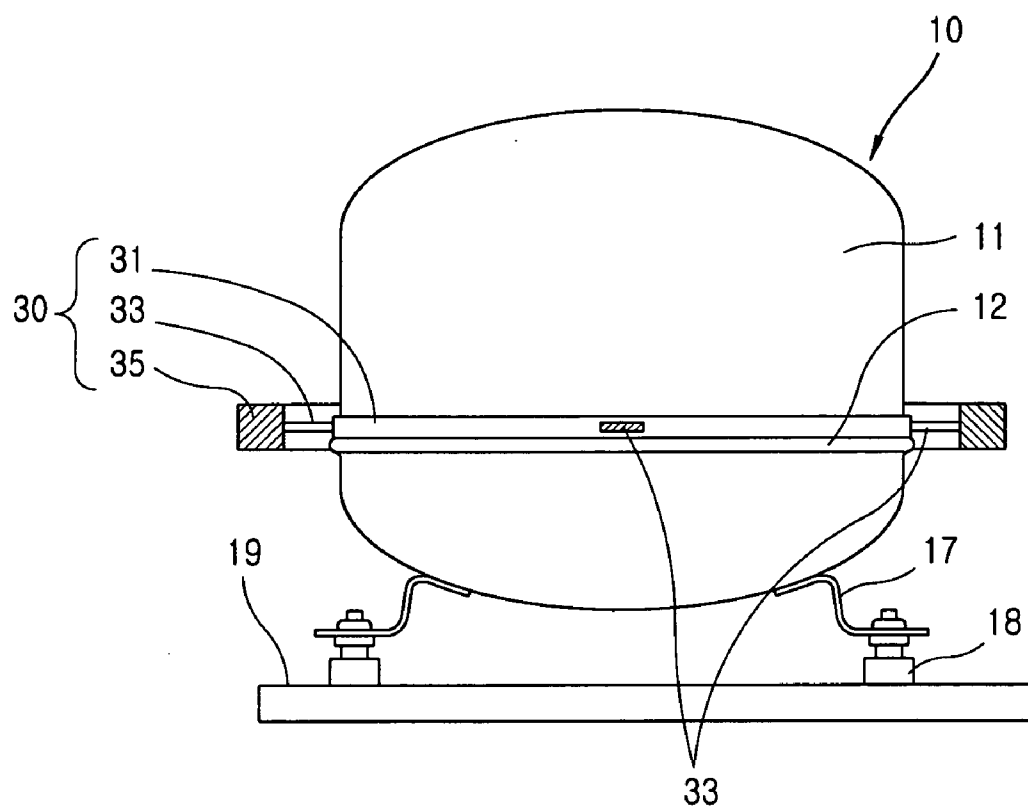


FIG. 6

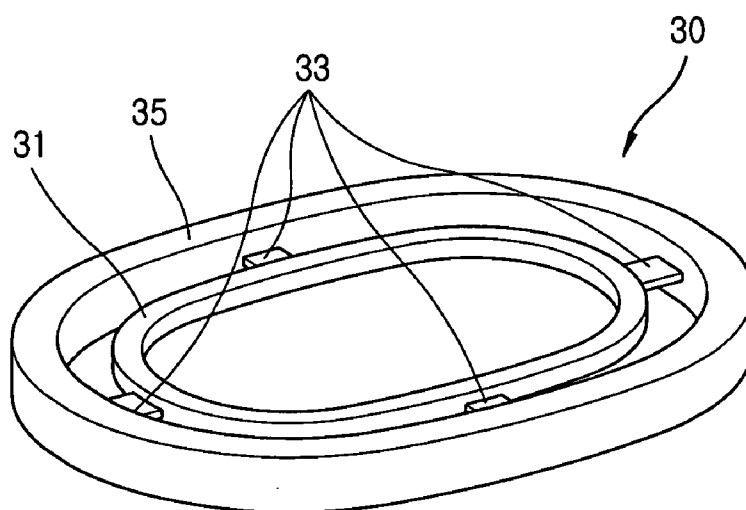
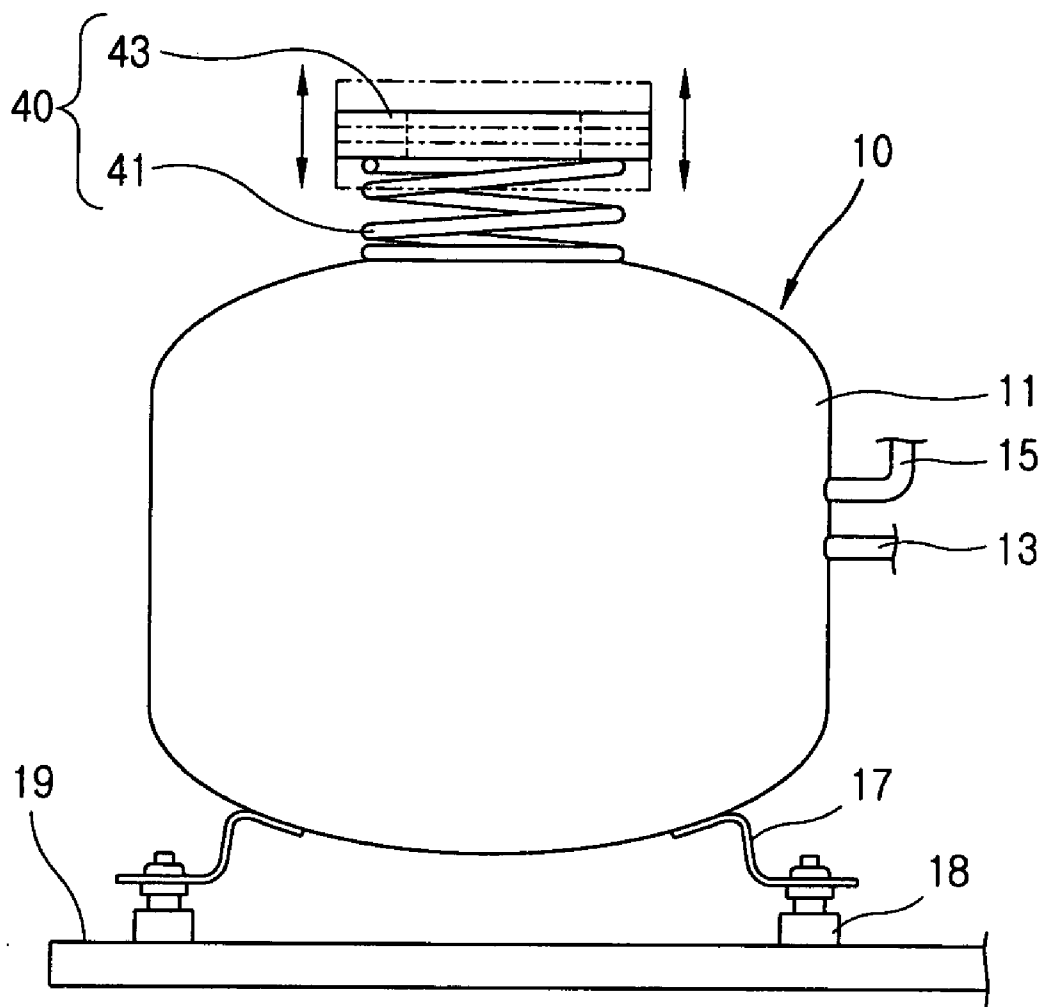


FIG. 7



APPARATUS FOR ABSORBING VIBRATION OF COMPRESSOR

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an apparatus for absorbing vibration of a compressor, and more particularly, to an apparatus for absorbing vibration of a compressor capable of reducing noise due to vibration and improving reliability of a compressor by reducing vibration of a compressor.

[0003] 2. Description of the Background Art

[0004] In general, a compressor is an apparatus for changing mechanical energy to compression energy of a compressible fluid.

[0005] FIG. 1 is a side view showing an installation state of a conventional compressor. As shown therein, the compressor includes a case 101 having a receiving space therein; a compression part (not shown) received inside the case 101, for compressing a fluid; and an motor part (not shown) received inside the case 101, for providing a driving force to the compression part.

[0006] A suction pipe 103 for sucking a fluid and a discharge pipe 105 for discharging the compressed fluid are respectively connected to the case 101 of the compressor. The suction pipe 103 and the discharge pipe 104 are respectively connected to components such as a heat exchanger or the like. A fluid for compressing is sucked through the suction pipe 103, and the compressed fluid is discharged through the discharge pipe 104.

[0007] A mount bracket 107 is integrally coupled to a lower portion of the case 101 in order to fixedly install the case 101 at an installation surface 110. A plurality of rubbers 108 for reducing vibration are coupled to the mount bracket 107 in order to reduce the amount of vibration of the compressor, transmitted to the installation surface 110.

[0008] In the conventional compressor, when vibration is generated from the compressor, the rubber 108 for reducing vibration, installed between the installation surface 110 and the mount bracket 107, reduces the amount of vibration transmitted to the installation surface. However, since the suction pipe 103 and the discharge pipe 105 connected to the compressor case 101 are respectively connected to other components such as a heat exchanger or the like, the vibration generated from the compressor is transmitted to the components along the suction pipe 103 and the discharge pipe 105, thereby causing degradation of performance of the components, shortening their life spans, and generating noise due to the vibration.

SUMMARY OF THE INVENTION

[0009] Therefore, an object of the present invention is to provide an apparatus for absorbing vibration of a compressor capable of improving reliability of a component, lengthening its life span, and reducing noise due to vibration by absorbing vibration generated from the compressor itself.

[0010] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an

apparatus for absorbing vibration of a compressor comprising: an elastic body mounted at an outer surface of a compressor case and elastically deformed when vibration is generated at a compressor; and a mass body connected to the elastic body, resonating with the compressor, for absorbing vibration of the compressor.

[0011] Here, preferably, A plurality of the elastic bodies are disposed at an outer surface of the compressor at regular intervals in a circumferential direction.

[0012] Effectively, the elastic body is connected to a side surface of the compressor, being extended outwardly.

[0013] Preferably, the mass body is formed in a ring shape.

[0014] Preferably, a fixing part which is integrally and fixedly coupled to the outer surface of the compressor is further included, and, effectively, the elastic body is integrally connected to the fixing part.

[0015] Preferably, a stopper which is outwardly protruded is formed at an outer surface of the case of the compressor in order to support the fixing part.

[0016] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a unit of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0018] In the drawings:

[0019] FIG. 1 is a side view showing an installation state of the conventional compressor;

[0020] FIG. 2 is a side view of a compressor provided with an apparatus for absorbing vibration in accordance with a first embodiment of the present invention;

[0021] FIG. 3 is a plan view of a compressor provided with an apparatus for absorbing vibration in accordance with a first embodiment of the present invention;

[0022] FIG. 4 is a sectional view taken along line IV-IV of FIG. 3;

[0023] FIG. 5 is a sectional view equivalent to FIG. 4, showing a compressor provided with an apparatus for absorbing vibration in accordance with a second embodiment of the present invention;

[0024] FIG. 6 is a perspective view of an apparatus for absorbing vibration in accordance with a second embodiment of the present invention; and

[0025] FIG. 7 is a side view of a compressor provided with an apparatus for absorbing vibration in accordance with a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0027] There may be a plurality of embodiments of an apparatus for absorbing vibration of a reciprocating compressor in accordance with the present invention, and hereinafter, the most preferred embodiments will now be described.

[0028] FIG. 2 is a side view of a compressor provided with an apparatus for absorbing vibration in accordance with a first embodiment of the present invention, FIG. 3 is a plan view of a compressor provided with an apparatus for absorbing vibration in accordance with a first embodiment of the present invention, and FIG. 4 is a sectional view taken along line IV-IV of FIG. 3.

[0029] The compressor in accordance with the present invention includes: a compressor main body 10 for compressing a fluid; and an apparatus 20 for absorbing vibration, mounted at an outer side of the compressor main body 10, for absorbing vibration generated from the compressor main body 10.

[0030] The compressor main body 10 includes a case 11 having a certain closed space; a motor part (not shown) mounted in the case 11, for generating a driving force; and a compression part (not shown) for compressing a fluid by the driving force generated from the motor part.

[0031] A suction pipe 13 and a discharge pipe 15 are respectively connected to the outside of the case 11 in order to suck and discharge a fluid and are respectively connected to components such as a heat exchanger or the like. A fluid for compressing is sucked through the suction pipe 13, and the compressed fluid is discharged through the discharge pipe 15.

[0032] A mount bracket 17 for fixing the compressor main body 10 to an installation surface 19 is mounted at a lower portion of the case 11. A plurality of rubbers 18 for reducing vibration is coupled to the mount bracket 17 and disposed between the mount bracket 17 and the installation surface 19, making the case 11 isolated from the installation surface 19 at a prescribed distance.

[0033] The apparatus 20 for absorbing vibration includes a plurality of elastic bodies 21 disposed at an outer surface of the case 11, extended therefrom in a radial direction of the case 11, having one end mounted at an outer surface of the case 11 and elastically deformed when vibration is generated at the compressor main body 10; and a mass body 23 mounted at the other end of each elastic body 21, resonating with the compressor main body 10, for absorbing vibration of the compressor main body 10.

[0034] Preferably, the elastic body 21 is designed as a plate spring or a coil spring having a proper elastic force so that the mass body 23 can have the same natural frequency as natural frequency (in general, 60 Hz) of the compressor main body 10. Preferably, one side of the elastic body 21 is coupled to the case 11 by a method such as welding or the like, and its other side is coupled to the mass body 23 by a method such as welding or the like.

[0035] The mass body 23 is formed in a ring shape and disposed in a circumferential direction of the case 11, and, preferably, the mass of the mass body 23 is designed to be 5~25% of the mass of the compressor main body 10.

[0036] An operation of the compressor provided with a general apparatus for absorbing vibration constructed as above will now be described.

[0037] When the compressor is driven, a driving force generated from the motor part (not shown) is transmitted to the compression part, and a fluid introduced through the suction pipe 13 of the compression part is discharged to the discharge pipe 15 after being compressed. During a compressing process of the fluid, vibration is generated, and the vibration is transmitted to components such as the compressor case 11, the suction pipe 13, the discharge pipe 15, a heat exchanger connected thereto, or the like. At this time, the vibration generated in driving of the compressor is transmitted to the mass body 23 by the elastic body 21 so that the compressor is little vibrated, and the mass body 23 is vibrated with natural frequency of the compressor main body 10. In more detail, vibration of the case 11 of the compressor causes deformation of the elastic body 21 when the compressor is driven. By the deformation of the elastic body 21, vibration energy is transmitted to the mass body 23. Accordingly, the mass body 23 absorbs the vibration generated at the compressor main body 10 so that the vibration is little transmitted to the components such as the suction pipe 13 and the discharge pipe 15 which are connected to the compressor case 11 and a heat exchanger connected thereto, thereby reducing the noise generation and degradation of reliability of components due to the vibration.

[0038] FIG. 5 is a sectional view equivalent to FIG. 4, showing a compressor provided with an apparatus for absorbing vibration in accordance with a second embodiment of the present invention, and FIG. 6 is a perspective view of an apparatus for absorbing vibration in accordance with a second embodiment of the present invention. As shown therein, the present compressor includes an elastic body 33 mounted at an outer surface of the compressor case 11 and elastically deformed when vibration is generated from the compressor; and a mass body 35 connected to the elastic body 33, resonating with the compressor, for absorbing vibration of the compressor. The compressor further includes a fixing part 31 mounted at an outer circumferential surface of the compressor case 11, for fixing the elastic body 33 to the compressor case 11. Since the elastic body 31 and the mass body 35 have the same structure as the above-mentioned structure, descriptions thereabout will be omitted.

[0039] Preferably, the fixing part 31 is formed in a ring shape, insertedly coupled to an outer circumferential surface of the case, and the elastic bodies 33 are connected thereto at regular intervals therebetween in an outer circumferential direction of the fixing part 31. A stopper 12 for preventing the fixing part 31, insertedly coupled to the case 11 from being slipped out is formed at the case 11. Since the fixing part 31 is integrally coupled to the compressor main body 10 and thus vibrated therewith, the mass of the compressor main body 10 is calculated with the mass of the fixing part 31 included, and the mass of the mass body is 5~25% of the mass of the compressor main body 10. Preferably, the elastic body 33 is designed to have a proper elastic force so that the mass body 35 resonates with the compressor main body 10.

[0040] Preferably, the stopper is outwardly protruded from the circumferential surface of the case 11 to support the apparatus 30 for absorbing vibration at its lower side. Here, the fixing part 31 may be coupled to the case 11 by a press fit method or the like, or, by providing a special bracket at the case 11, the fixing part 31 may be engaged with the bracket by a screw or the like.

[0041] In case of the second embodiment, the apparatus **30** for absorbing vibration can be more stably supported at the case **11** of the compressor by the fixing part **31**. Furthermore, the apparatus **30** for absorbing vibration and the fixing part **31** are separately fabricated and coupled to the case of the compressor, thereby simplifying a fabrication process.

[0042] **FIG. 7** is a side view of a compressor having an apparatus for absorbing vibration in accordance with a third embodiment of the present invention. As shown therein, in the compressor in accordance with the present invention, an apparatus for absorbing vibration is disposed at an upper surface of the compressor case **11** so as to resonate with the compressor in upper and lower directions.

[0043] The apparatus **40** for absorbing vibration includes an elastic body **41** having one end integrally coupled to an upper surface of the case **11** of the compressor so as to expand and contract in upper and lower directions; and a mass body **43** integrally coupled to an upper end of the elastic body **41**. Preferably, the apparatus for absorbing vibration is positioned at a place the compressor main body **10** is most greatly vibrated in upper and lower directions.

[0044] The elastic body **41** is formed as a coil spring which can expand and contract in upper and lower directions, and its upper end and lower end are respectively and integrally coupled to the mass body **43** and the upper surface of the case **11** by a method such as welding or the like.

[0045] Preferably, the mass body **43** is formed as a plate and mounted at the upper surface of the elastic body **41**.

[0046] An operation of the apparatus for absorbing vibration in accordance with the present invention will now be described. The vibration in upper and lower directions, which is generated in driving of the compressor causes deformation of the elastic body **41**, thereby vibrating the mass body **43**. That is, vibration energy of the compressor main body **10** is changed into elastic energy of the elastic body **41** and is changed again into vibration energy of the mass body **43**, so the mass body **43** which absorbs the vibration of the compressor main body **10** is vibrated with natural frequency of the compressor. Accordingly, the compressor main body **10** is little vibrated.

[0047] Accordingly, the vibration is little transmitted to a compressor case, a suction pipe, a discharge pipe and components such as a heat exchanger connected thereto. The embodiment is effective when the compressor is vibrated in upper and lower directions.

[0048] As so far described, in the present invention, by providing an elastic body mounted at a compressor case and elastically deformed when vibration is generated at the compressor; and a mass body connected to the elastic body, resonating with the compressor, for absorbing vibration of the compressor, the vibration of the compressor case in driving of the compressor causes deformation of the elastic body, the vibration energy is transmitted to the mass body by the deformation of the elastic body, and thus the mass body absorbs the vibration generated at the compressor main body. Accordingly, the vibration is little transmitted to a suction pipe, and a discharge pipe connected to the compressor case and components such as a heat exchanger connected thereto. Accordingly, the apparatus for absorbing vibration of the compressor can reduce noise generation and degradation of reliability of components, due to the vibration.

[0049] As the present invention may be embodied in several forms without departing from the spirit or essential

characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. An apparatus for absorbing vibration of a compressor comprising:

an elastic body mounted at an outer surface of a compressor case and elastically deformed when vibration is generated at a compressor; and

at least one mass body connected to the elastic body, resonating with the compressor, for absorbing vibration of the compressor.

2. The apparatus of claim 1, wherein a plurality of the elastic bodies are disposed at an outer surface of the case of the compressor at regular intervals in a circumferential direction.

3. The apparatus of claim 1, wherein the elastic body is a plate spring having one end connected to an outer surface of the compressor case and the other end connected to the mass body.

4. The apparatus of claim 2, wherein the elastic body is a coil spring having one end connected to an outer surface of the compressor case and the other end connected to the mass body.

5. The apparatus of claim 1, wherein the mass body is formed in a ring shape and disposed in a circumferential direction of the compressor case.

6. The apparatus of claim 1, wherein the mass of the mass body is about 5~25% of the mass of the compressor main body.

7. The apparatus of claim 2, further comprising a fixing member mounted at an outer circumferential surface of the compressor case, for fixing the elastic body to the compressor case.

8. The apparatus of claim 7, wherein the fixing member is formed in a ring shape and insertedly coupled to the outer surface of the compressor case in a circumferential direction.

9. The apparatus of claim 7, wherein the elastic bodies are integrally formed at an outer surface of the fixing member at regular intervals.

10. The apparatus of claim 7, further comprising a stopper for preventing the fixing member which is insertedly coupled to the compressor case from being slipped out.

11. The apparatus of claim 10, wherein the stopper is outwardly protruded from an circumferential surface of the compressor case.

12. The apparatus of claim 9, wherein the elastic body is a coil spring mounted at an upper surface of the compressor case.

13. The apparatus of claim 1, wherein the elastic body is a coil spring mounted at an upper surface of the compressor case.

14. The apparatus of claim 13, wherein the mass body is formed in a plate shape and mounted at an upper surface of the elastic body.