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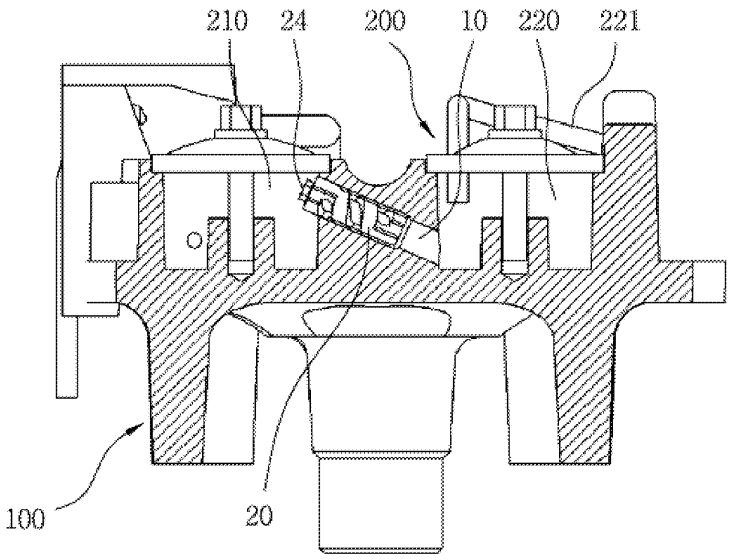
(54) HERMETICALLY-SEALED COMPRESSOR IN WHICH MEMBER FOR REDUCING DISCHARGE PULSATIONS IS INSTALLED

(57) The present disclosure relates to a hermetic compressor with a discharge pulsation reducing member mounted therein, the hermetic compressor including a case; a cylinder block disposed in the case; a discharge muffler disposed on the upper portion of the cylinder block and having a first chamber and a separate second chamber to reduce the pulsating components of the discharged refrigerant, the first chamber and the second chamber being connected to each other by a connection passage inside the discharge muffler; and the discharge pulsation reducing member fixed in the connection passage and having a pulsation reducing passage formed along the outer peripheral surface thereof.

Fig. 3



EP 2 716 911 A1

Description

[Technical Field]

[0001] The present invention relates to a compressor, and more particularly, to a hermetic compressor that has a discharge pulsation reducing member mounted thereon to control the pulsating components of a working fluid and to reduce the vibration and noise generated from the compressor during the refrigeration cycle.

[Background Art]

[0002] Generally, a refrigeration cycle is a process wherein compressed refrigerant gas having a high temperature and high pressure by operation of a compressor is liquefied by a condenser and then vaporized in an evaporator via an expansion valve, thereby conducting cooling using the vaporization heat of the refrigerant.

[0003] In the process of the refrigeration cycle, the compressor is a device for compressing the gaseous refrigerant from the evaporator, where the liquid refrigerant is evaporated and cooled by removing the surrounding heat, into high temperature and high pressure.

[0004] However, the pulsating components, which are generated when the gaseous refrigerant is discharged from the compressor to the condenser, excite the pipe of the refrigeration cycle, thereby generating noise and vibrations in the refrigeration cycle.

[0005] To reduce the above-mentioned problems, a discharge muffler is mounted on a cylinder block to reduce the noise in the discharge passage of the compressor.

[0006] The discharge muffler is adapted to reduce the pulsation of the refrigerant discharged from the compressor, and is separated into a first chamber and a second chamber connected to each other by a connection passage.

[0007] Further, the first chamber is connected by a passage to a cylinder cover having a space into which a high pressure refrigerant is supplied from a cylinder, and the second chamber is connected to a discharge pipe.

[0008] In the conventional practice, the noise caused from the pulsation of the refrigerant is reduced by the discharge muffler having the above-mentioned configuration, but if the connection passage connecting the first chamber and the second chamber is provided only by a casting process, the length of the connection passage is restricted, and the pulsation reducing effects are limited.

[0009] To overcome the above-mentioned problems, recently, there have been proposed technologies where a pipe having a given inner diameter and length connects the first chamber and the second chamber, thereby reducing the pulsating components of the refrigerant much more.

[0010] In this case, however, the pipe is exposed to the exterior of the cylinder block and interferes with the internal wall of the external case of the compressor, and therefore, the installation of the pipe should be considered upon designing the external case. Especially, if the pipe is mounted inside the chamber, the chamber should be increased in size to accommodate the pipe therein, thereby making the size of the cylinder block undesirably bulky.

[0011] Accordingly, the space utilization and productivity of the compressor are decreased.

[Disclosure]

[Technical Problem]

[0012] Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide a hermetic compressor with a discharge pulsation reducing member therein that has a connection passage in a cylinder block to connect a first chamber and a second chamber, and the discharge pulsation reducing member fixedly mounted inside the connection passage to increase the refrigerant passage, thereby reducing the discharge pulsation, without any separate installation space.

[Technical Solution]

[0013] To accomplish the above object, according to the present invention, there is provided a hermetic compressor with a discharge pulsation reducing member therein, the hermetic compressor including a case; a cylinder block in the case; a discharge muffler on an upper portion of the cylinder block and having a first chamber and a separate second chamber to reduce pulsating components of discharged refrigerant, the first chamber and the second chamber being connected to each other by a connection passage; and the discharge pulsation reducing member fixed in the connection passage and having a pulsation reducing passage along an outer peripheral surface thereof.

[0014] According to the present invention, preferably, the pulsation reducing passage together with the connection passage form a passage for the refrigerant.

[0015] According to the present invention, preferably, the pulsation reducing passage of the discharge pulsation reducing member has a screw shape.

[0016] According to the present invention, preferably, the discharge pulsation reducing member is screwed to the connection passage corresponding thereto.

[0017] According to the present invention, preferably, the discharge pulsation reducing member is tapered in the longitudinal direction thereof and fixed to the connection passage by an interference fit.

[0018] According to the present invention, preferably, the discharge pulsation reducing member has a head having one of various shapes to allow a use a tool to be used for the coupling to the connection passage.

[0019] According to the present invention, preferably,

the discharge pulsation reducing member has a cross-sectional shape selected from a circular shape and a polygonal shape.

[0020] According to the present invention, preferably, the pulsation reducing passage has an inlet and an outlet on opposed ends thereof in communication with each other in the longitudinal direction thereof.

[Advantageous Effects]

[0021] According to the present invention, the hermetic compressor with a discharge pulsation reducing member mounted therein is provided with a connection passage in the cylinder block to connect the first chamber and the second chamber and with the discharge pulsation reducing member fixed in the connection passage to increase the refrigerant passage length, thereby controlling pulsating components of the refrigerant and further reducing the vibrations and noise generated during the refrigeration cycle.

[0022] In addition, the discharge pulsation reducing member is mounted fixedly inside the connection passage in the cylinder block, and accordingly, no separate installation space is needed, thereby decreasing the size of the external case of the compressor and thus increasing the space utilization and productivity of the compressor.

[0023] Further, the length and cross-sectional area of the pulsation reducing passage of the discharge pulsation reducing member can be changed in accordance with the pulsation properties of the compressor, thereby controlling the pulsation in accordance with the discharge states of the refrigerant.

[Description of Drawings]

[0024]

FIGS. 1 and 2 are cutaway perspective and front cross-sectional views showing a hermetic compressor with a discharge pulsation reducing member mounted therein according to the present invention.

FIG. 3 is a cross-sectional view showing the hermetic compressor with a discharge pulsation reducing member mounted therein according to the present invention.

FIG. 4 is a perspective view showing one example of the discharge pulsation reducing member of FIG. 3.

FIGS. 5 and 6 are perspective views showing other examples of the discharge pulsation reducing member in the hermetic compressor according to the present invention.

FIG. 7 is a graph showing the discharge pulsations between the invention and a comparison example.

[Detailed Description]

[0025] Hereinafter, an explanation of a hermetic compressor with a discharge pulsation reducing member mounted therein according to the present invention will be given in detail with reference to the attached drawings, FIG. 1 to FIG. 7.

[0026] According to the present invention, as shown in FIGS. 1 and 2, a hermetic compressor with a discharge pulsation reducing member mounted therein, which is installed in a machine room of a refrigerator and connected to a condenser (not shown) to compress gaseous refrigerant to a high pressure and to supply the compressed refrigerant to the condenser, generally includes a case 1, a cylinder block 100 disposed in the case 1 and a discharge muffler 200 disposed in an upper portion of the cylinder block 100 to reduce the pulsating components of the discharged refrigerant.

[0027] The discharge muffler 200 has a first chamber 210 and a separate second chamber 220, and the first chamber 210 and the second chamber 220 are connected to each other by a connection passage 10.

[0028] Further, the first chamber 210 is connected by a passage 212 to a cylinder cover 211 having a space on one side thereof to receive the high pressure refrigerant discharged from a cylinder, and the second chamber 220 is connected to a discharge pipe 221.

[0029] In this case, the connection passage 10 serves to connect the first chamber 210 and the second chamber 220 to each other and further to control the pulsating components of the refrigerant.

[0030] That is, after the high temperature and high pressure refrigerant introduced into the discharge muffler 200 flows into the first chamber 210, it is passed through the connection passage 10 and sent to the second chamber 220, so that the flow velocity of the refrigerant is reduced and the refrigerant having a reduced flow velocity is supplied to the condenser through the discharge pipe 221.

[0031] According to the present invention, as shown in FIG. 3, a discharge pulsation reducing member 20, which has a bar-like shape to increase the passage length of the refrigerant, is fixedly inserted into the connection passage 10 to reduce the pulsating components of the refrigerant, that is, the vibrations and noise, under the conditions where the size and shape of the discharge muffler 200 are not changed.

[0032] As shown in FIGS. 4 to 6, the discharge pulsation reducing member 20 according to the present invention includes a groove-shaped pulsation reducing passage 21 formed along the outer peripheral surface thereof and an inlet 22 and an outlet 23 on opposed ends of the pulsation reducing passage 21 in communication with each other in the longitudinal direction thereof.

[0033] To rigidly fix the discharge pulsation reducing member 20 having the above-mentioned structure to the connection passage 10, a screw thread is formed along the outer peripheral surface of the discharge pulsation

reducing member 20, and a screw thread to be fastened correspondingly to the screw thread on the discharge pulsation reducing member 20 is formed along the connection passage 10, so that the discharge pulsation reducing member 20 and the connection passage 10 are screwed to each other. Alternatively, the discharge pulsation reducing member 20 is tapered in the longitudinal direction thereof and fixed to the connection passage 10 by an interference fit.

[0034] Accordingly, the pulsation reducing passage 21 together with the connection passage 10 form a passage for the refrigerant.

[0035] When the discharge pulsation reducing member 20 is screwed into the connection passage 10, desirably, the position and length of the screw thread for fastening the discharge pulsation reducing member 20 to the connection passage 10 are appropriately adjusted in accordance with machining conveniences, and to easily use a tool for coupling to the connection passage 10, a head 24 of the discharge pulsation reducing member 20 may preferably have one of various shapes.

[0036] In addition to a circular cross-sectional shape, the discharge pulsation reducing member 20 may have a polygonal cross-sectional shape.

[0037] Accordingly, the discharge pulsation reducing member 20 on or in which the pulsation reducing passage 21 is formed is mounted along the inner peripheral surface of the connection passage 10 connecting the first chamber 210 and the second chamber 220 of the discharge muffler 200, so that the refrigerant introduced into the first chamber 210 is passed through the inlet 22 and the pulsation reducing passage 21 of the discharge pulsation reducing member 20, and is sent to the second chamber 220 through the outlet 23.

[0038] That is, the length of the connection passage 10 can be extended through the pulsation reducing passage 21 on or in the discharge pulsation reducing member 20, so that the flow velocity of the refrigerant supplied from the first chamber 210 to the second chamber 220 through the connection passage 10 can be reduced to remarkably dampen the noise or vibrations generated in the compressor.

[0039] Preferably, the pulsation reducing passage 21 is adjustable in length and cross-sectional area to conduct pulsation control corresponding to the pulsating components, and accordingly, the length and cross-sectional area of the pulsation reducing passage 21 are appropriately adjusted in accordance with the frequencies to control the pulsating components.

[0040] That is, the pulsation reducing passage 21 formed in the discharge pulsation reducing member 20 can have various shapes, such as a screw-shaped passage, etc., to adjust the length thereof.

[0041] FIG. 7 is a graph showing the discharge pulsations between the invention and a comparison example. According to the present invention, the graph shows the frequency bands of the refrigerant measured when the discharge pulsation reducing member 20 is disposed in the connection passage 10 formed between the first chamber 210 and the second chamber 220, but according to the comparison example, the graph shows the frequency bands of the refrigerant measured in the absence of the discharge pulsation reducing member 20.

[0042] As shown in FIG. 7, it can be appreciated that the low frequency components in the frequency bands between 100Hz and 300Hz are reduced by the installation of the discharge pulsation reducing member 20.

[0043] According to the present invention, the discharge pulsation reducing member 20 is in the connection passage 10 between the first chamber 210 and the second chamber 220, but it is not necessarily limited thereto. That is, the discharge pulsation reducing member 20 may be disposed at any position if it can reduce the vibrations and noise generated during the refrigeration cycle. For example, if enough space is in a valve seat surface 213 of the cylinder block 100, the discharge pulsation reducing member 20 may be disposed on or in the valve seat surface 213 and the passage 212 of the first chamber 210 of the discharge muffler 200.

[0044] While the present invention has been described with reference to particular illustrative embodiments, it is not to be restricted by the embodiments, but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

Claims

1. A hermetic compressor with a discharge pulsation reducing member mounted therein, comprising:

   a case;
   a cylinder block in the case;
   a discharge muffler on an upper portion of the cylinder block and having a first chamber and a separate second chamber to reduce pulsating components of discharged refrigerant, the first chamber and the second chamber being connected to each other by a connection passage; and
   the discharge pulsation reducing member fixed in the connection passage and having a pulsation reducing passage along an outer peripheral surface thereof.

2. The hermetic compressor according to claim 1, wherein the pulsation reducing passage together with the connection passage form a passage for the refrigerant.

3. The hermetic compressor according to claim 1 or 2, wherein the pulsation reducing passage of the discharge pulsation reducing member has a screw shape.

4. The hermetic compressor according to claim 1 or 2, wherein the discharge pulsation reducing member is screwed to the connection passage corresponding thereto.

5. The hermetic compressor according to claim 1 or 2, wherein the discharge pulsation reducing member is tapered in the longitudinal direction thereof and fixed to the connection passage by an interference fit.

6. The hermetic compressor according to claim 1 or 2, wherein the discharge pulsation reducing member has a head having one of various shapes to allow a tool to be used for coupling to the connection passage.

7. The hermetic compressor according to claim 1 or 2, wherein the discharge pulsation reducing member has a cross-sectional shape selected from a circular shape and a polygonal shape.

8. The hermetic compressor according to claim 3, wherein the pulsation reducing passage has an inlet and an outlet on opposed ends thereof in communication with each other in the longitudinal direction thereof.

Fig. 1

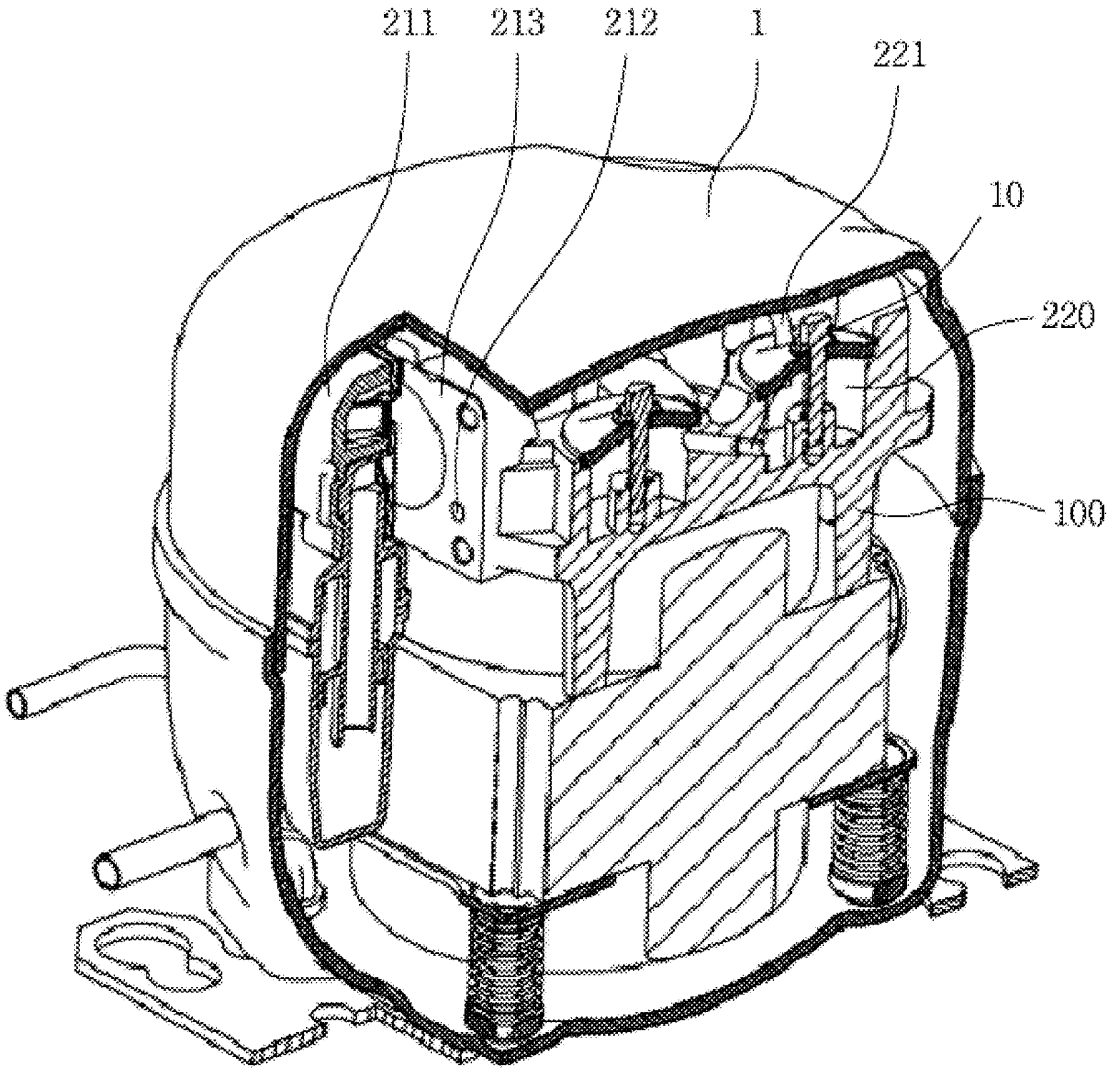


Fig. 2

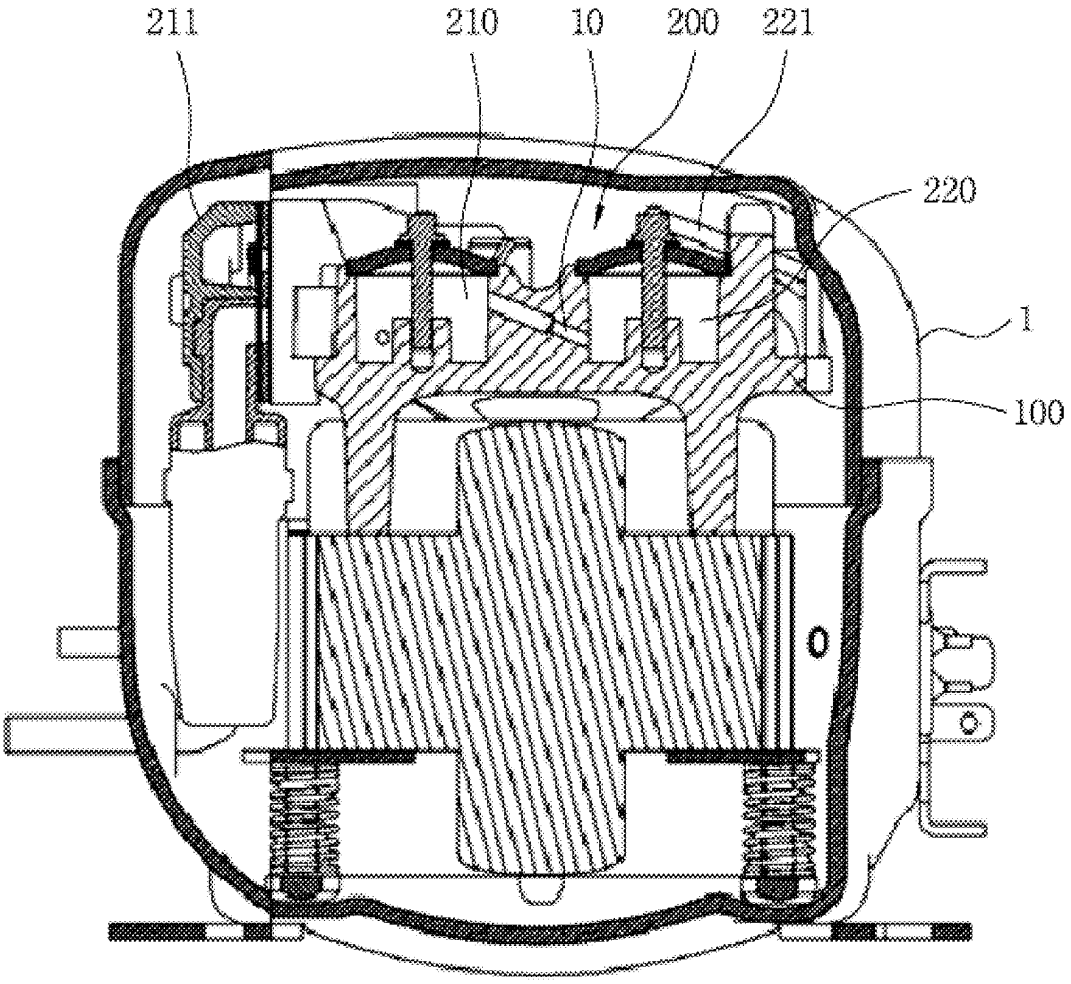


Fig. 3

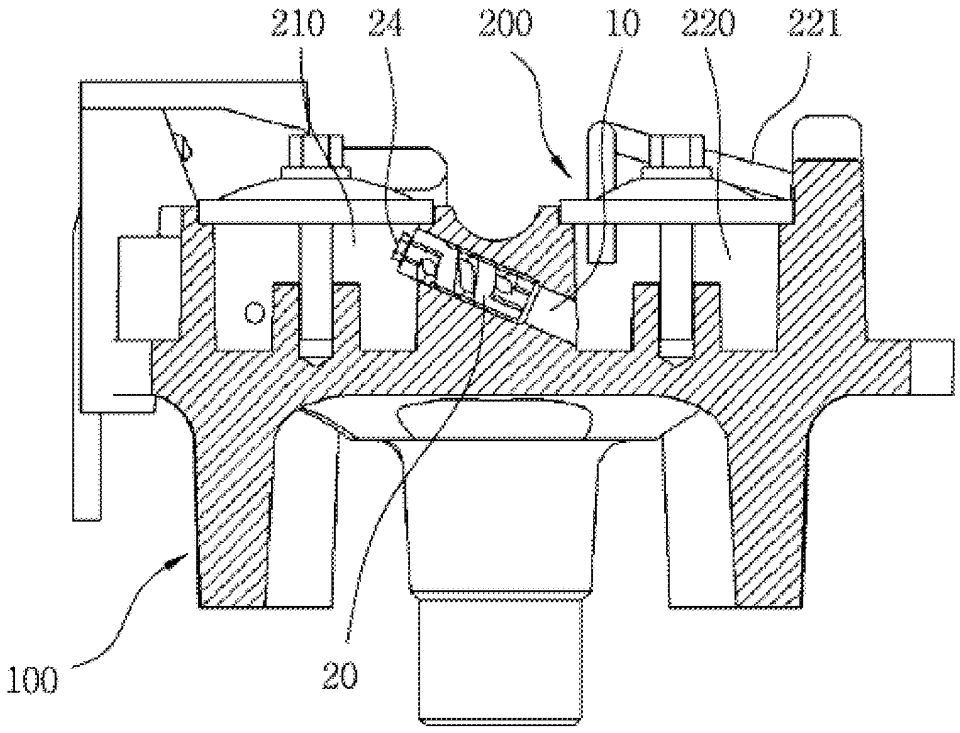


Fig. 4

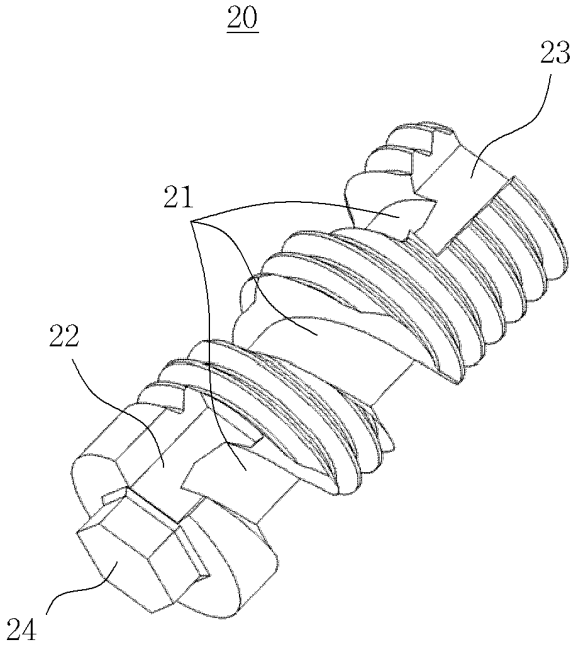


Fig. 5

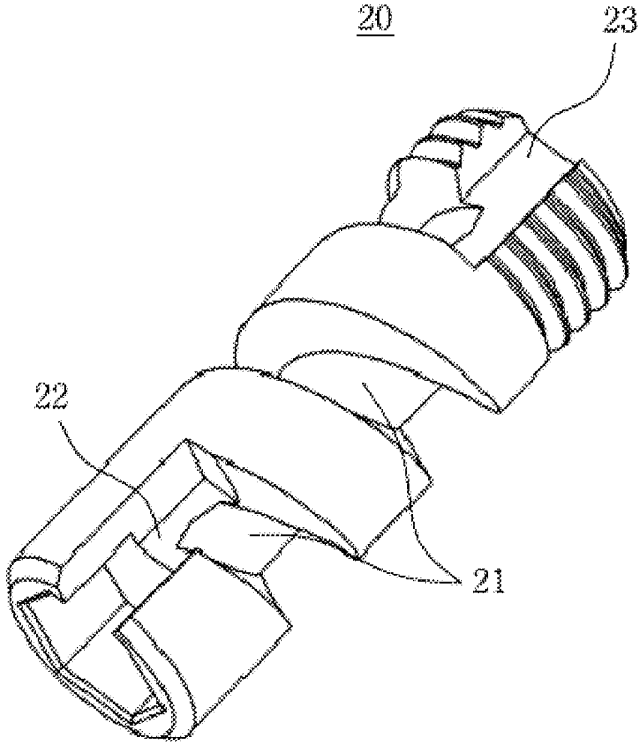


Fig. 6

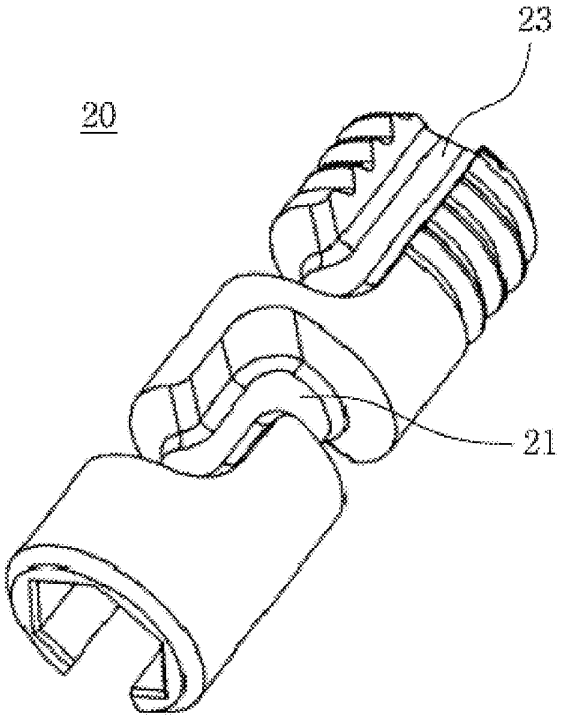
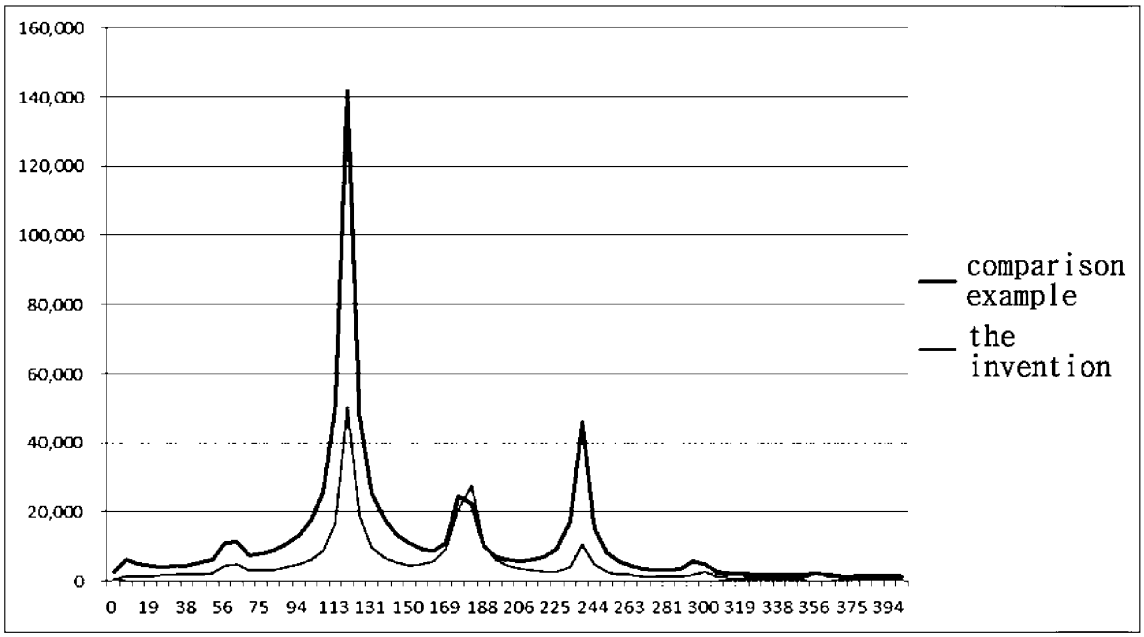


Fig. 7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0 19 38 56 75 94 113 131 150 169 188 206 225 244 263 281 300 319 338 356 375 394
comparison example
the invention

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/004416

A. CLASSIFICATION OF SUBJECT MATTER

F04B 39/00(2006.01)i, F04B 53/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F04B 39/00; F04C 29/00; F16L 55/04; H01H 35/34; F04B 53/00; F25B 1/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: sealing, compressor, cylinder, pulsatory motion, reduction, chamber, screw, spiral

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-048091 A (PANASONIC CORP.) 04 March 2010 See abstract, paragraphs [0025]-[0037] and figures 1-3.	1-7
A		8
Y	JP 2005-302629 A (NISSAN DIESEL MOTOR CO., LTD.) 27 October 2005 See abstract, paragraphs [0023]-[0032] and figures 1-6, 8.	1-7
A	KR 10-2007-0017266 A (SAMSUNG GWANGJU ELECTRONICS CO., LTD.) 09 February 2007 See abstract, pages 4, 5 and figures 3, 4.	1-8
A	KR 10-2008-0008052 A (SAMSUNG GWANGJU ELECTRONICS CO., LTD.) 23 January 2008 See abstract, pages 4, 5 and figures 4, 5.	1-8
A	JP 2008-101571 A (MATSUSHITA ELECTRIC IND. CO., LTD.) 01 May 2008 See abstract, paragraphs [0028]-[0048] and figures 1-4.	1-8

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 AUGUST 2013 (12.08.2013)	**13 AUGUST 2013 (13.08.2013)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2013/004416

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