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(54) Scroll type fluid machinery.

(57) According to the present invention, there is provided a scroll type fluid machinery in which a stationary scroll and a revolving scroll provided with spiral wraps set up on end plates, respectively, are engaged with each other and housed in a housing, the stationary scroll is fixed to the housing, and the revolving scroll is made to revolve in a solar motion while checking the rotation on its axis by means of a mechanism for checking rotation on its axis, wherein a low pressure chamber forming unit (33) which partitions the inside of the housing into a low pressure chamber (32) and a high pressure chamber (31) of above-mentioned machinery is disposed on the outside of the end plate of the stationary scroll, and a low pressure chamber (32) which communicates with the low pressure chamber (34) is formed between the end plate of the stationary scroll and the high pressure chamber by means of this low pressure chamber forming unit (33), thereby to prevent or reduce deformation of the end plate of the stationary scroll.

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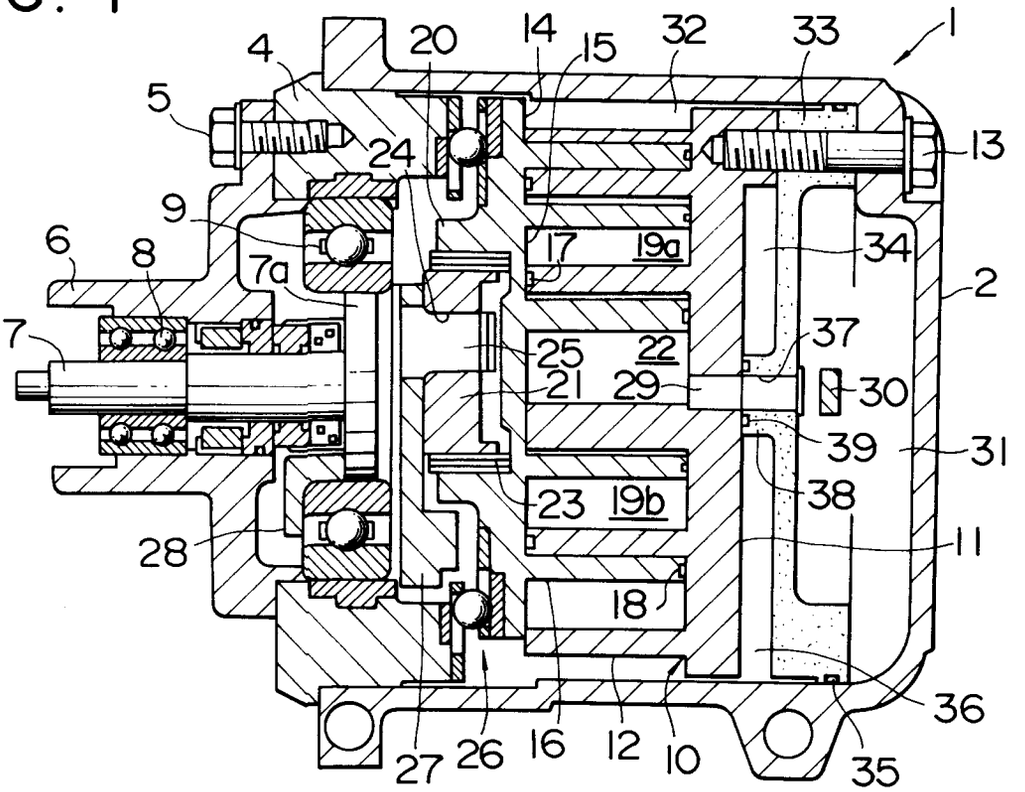
FIG. 1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FIELD OF THE INVENTION AND RELATED ART STATEMENT

The present invention relates to a scroll type fluid machinery used as a compressor, an expansion machinery and the like.

Fig. 3 shows an example of a conventional scroll type compressor of this sort.

In Fig. 3, a housing 1 consists of a cup-shaped main body 2, a front end plate 4 which is clamped to the main body 2 with bolts not shown, and a front cover 6 which is clamped to the front end plate 4 with a bolt 5. A rotary shaft 7 penetrates through the front cover 6 and is supported rotatably by the housing 1 through a bearing 8 provided between the front cover 6 and the rotary shaft 7 and a bearing 9 provided between a boss 7a thereof and the front end plate 4.

A stationary scroll 10 and a revolving scroll 14 are housed inside the housing 1.

The stationary scroll 10 is provided with an end plate 11 and a spiral wrap 12 set up on the inner surface thereof and the outer peripheral surface of the end plate 11 is brought into close contact with the inner peripheral surface of the cup-shaped main body 2 and clamped with a bolt 13 thereto. Thus, a high pressure chamber 31 is delimited on the outside of the end plate 11, and a low pressure chamber 32 is delimited on the inside thereof.

The revolving scroll 14 is provided with an end plate 15 and a spiral wrap 16 set up on the inside surface thereof, and the spiral wrap 16 has substantially the same configuration as the spiral wrap 12.

The revolving scroll 14 and the stationary scroll 10 are eccentric from each other by the radius of revolution, and are engaged with each other while shifting by an angle of 180° mutually as shown in the figure. At this time, a chip seal 17 disposed on an end surface of the spiral wrap 12 is brought into close contact with the inner surface of the end plate 15, a chip seal 18 embedded in the end surface of the spiral wrap 16 is brought into close contact with the inner surface of the end plate 11, and side surfaces of the spiral wraps 12 and 16 are brought into linear contact with each other at a plurality of locations. In such a manner, a plurality of closed small chambers 19a and 19b which form an approximate point symmetry with respect to the center of the spiral are delimited.

A bushing 21 is fitted rotatably in a cylindrical boss 20 projected at the central part of the outer surface of the end plate 15 of the revolving scroll 14 through a rotary bearing 23, and an eccentric pin 25 projected at an inner end of the rotary shaft 7 is fitted rotatably in an eccentric hole 24 bored in the bushing 21. Further, a balance weight 27 is fixed to this bushing 21.

A mechanism 26 for checking rotation on its axis which also serves as a thrust bearing is arranged between the outer peripheral edge of the outer surface of the end plate 15 and the inner surface of the front end plate 4. A sub-balance weight 28 is clamped on the boss 7a of the rotary shaft 7.

Thus, when the rotary shaft 7 is rotated, the revolving scroll 14 is driven through the eccentric pin 25, the bushing 21, the rotary bearing 23 and the boss 20, and the revolving scroll 14 revolves in a solar motion while being checked to rotate on its axis by means of the mechanism 26 for checking rotation on its axis.

When the revolution in a solar motion of the revolving scroll 14, the linear contact portion between the spiral wraps 12 and 16 moves toward the center of the spiral gradually. As a result, the closed small chambers 19a and 19b move toward the center of the spiral while reducing volumes thereof. In keeping with this, a gas suctioned into the low pressure chamber 32 through a suction port not shown is taken into the closed small chambers 19a and 19b from opening portions at outer peripheral ends of the spiral wraps 12 and 16 and reaches a central chamber 22 while being compressed. Then, the gas passes through a discharge port 29 bored in the end plate 11 of the stationary scroll 10 therefrom and pushes a discharge valve 30 open so as to be discharged into the high pressure chamber 31, and flows out through a discharge port not shown.

In above-mentioned conventional scroll type compressor, there is a fear that a high pressure gas in the above-mentioned high pressure chamber 31 acts on the outer surface of the end plate 11 of the stationary scroll 10 during operation, thereby to deform the end plate 11 to show depression at the center thereof.

When the end plate 11 is deformed, problems such as galling, abnormal friction and seizure on the inner surface of the end plate 11, particularly between the central part thereof and the tip surface of the spiral wrap 16 of the revolving scroll 14 and damages at the tip portion of the spiral wrap 16 are produced.

Therefore, it has been required to take such a countermeasure that the thickness of the end plate 11 is increased or the tooth height at the central part of the spiral of the spiral lap 16 is made lower than that of other parts. In such a countermeasure, however, there has been such a problem that the efficiency thereof is lowered.

OBJECT AND SUMMARY OF THE INVENTION

It is an object of the present invention which has been made in view of such circumstances to

provide a scroll type fluid machinery in which above-described problems are solved and reliability is improved.

In order to achieve above-mentioned object, it is the gist of the present invention to provide a scroll type fluid machinery in which a stationary scroll and a revolving scroll provided with spiral wraps set up on end plates, respectively, are engaged with each other and housed in a housing, the stationary scroll is fixed to the housing, and the revolving scroll is made to revolve in a solar motion while checking the rotation on its axis by means of a mechanism for checking rotation on its axis, characterized in that a low pressure chamber forming unit which partitions the inside of the housing into a low pressure chamber and a high pressure chamber of above-mentioned machinery is disposed on the outside of the end plate of the stationary scroll, and a low pressure chamber which communicates with the low pressure chamber is formed between the end plate of the stationary scroll and the high pressure chamber by means of this low pressure chamber forming unit.

In the present invention, the low pressure in the low pressure chamber is applied to the outer surface of the end plate of the stationary scroll with the construction described above. Therefore, deformation of the end plate is prevented or reduced.

As it is evident from above description, in the present invention, the low pressure in the low pressure chamber is applied to the outer surface of the end plate of the stationary scroll, thus preventing or reducing deformation of the end plate.

As a result, it is possible to prevent abnormal friction, seizure and galling between the inner surface of the end plate of the stationary scroll and the tip surface of the spiral lap of the revolving scroll and damages of the spiral lap, thus improving reliability of a scroll type fluid machinery.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal sectional view showing a first embodiment of the present invention;

Fig. 2 is a partial longitudinal sectional view showing a second embodiment of the present invention; and

Fig. 3 is a longitudinal sectional view of a conventional scroll type compressor.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A preferred embodiment of the present invention will be described in detail illustratively hereafter with reference to the drawings.

Fig. 1 shows a first embodiment of the present invention.

A low pressure chamber forming unit 33 is disposed on the outside of an end plate 11 of a stationary scroll 10, and is clamped to a cup-shaped main body 2 together with the stationary scroll 10 by means of a bolt 13. The outer peripheral surface of the unit 33 is installed on an inner peripheral surface of the cup-shaped main body 2 through a seal ring 35 so as to form an airtight structure, so that the inside of a housing 1 is partitioned into a low pressure chamber 32 and a high pressure chamber 31 by means of the unit 33. Further, a low pressure chamber 34 is delimited between the end plate 11 of the stationary scroll 10 and the high pressure chamber 31 by means of the unit 33, and the low pressure chamber 34 communicates with the low pressure chamber 32 through a through hole 36.

A hole 37 which communicates with a discharge port 29 is bored at the central part of the unit 33, and a tip of a cylindrical boss 38 projected toward the end plate 11 around the hole 37 is attached onto the outer surface of the end plate 11 through a seal ring 39 so as to form an airtight structure. Further, a discharge valve 30 opens and closes the outlet of the hole 37.

Other constructions are similar to that of a conventional compressor shown in Fig. 3. Same symbols are assigned to corresponding members, and the description thereof is omitted herein.

Thus, at the time of operation of a scroll type compressor, a low pressure gas suctioned into the low pressure chamber 32 enters into the low pressure chamber 34 through the through hole 36. Accordingly, the low pressure gas in the low pressure chamber 34 acts on the outer surface of the end plate 11 of the stationary scroll 10, and the pressing force applied to the end plate 11 becomes smaller substantially as compared with a conventional compressor, thereby to prevent or reduce deformation of the end plate 11.

Fig. 2 shows a second embodiment of the present invention, wherein the hole 37 is enlarged, the discharge valve 30 is disposed at the bottom of the hole 37, and the outlet of the discharge port 29 is opened and closed by means of the discharge valve 30.

In the second embodiment, the top clearance volume is reduced and performance of a compressor may be improved.

Claims

1. A scroll type fluid machinery in which a stationary scroll and a revolving scroll provided with spiral wraps set up on end plates, respectively, are engaged with each other and housed in a housing, said stationary scroll is fixed to said housing, and said revolving scroll

is made to revolve in a solar motion while checking the rotation on its axis by means of a mechanism for checking rotation on its axis, characterized in that a low pressure chamber forming unit which partitions the inside of said housing into a low pressure chamber and a high pressure chamber of above-mentioned machinery is disposed on the outside of the end plate of said stationary scroll, and a low pressure chamber which communicates with said low pressure chamber is formed between the end plate of said stationary scroll and said high pressure chamber by means of this low pressure chamber forming unit.

2. A scroll type fluid machinery according to Claim (1), characterized in that said low pressure chamber forming unit is held between said housing and the end plate of said stationary scroll, and is clamped to be fixed with a bolt from the outside of said housing together with said stationary scroll.

3. A scroll type fluid machinery according to Claim (1), characterized in that a hole (37) which communicates with a discharge port (29) provided at a central part of the end plate of said stationary scroll at one end and opens to said high pressure chamber at another end is provided in said low pressure chamber forming unit.

4. A scroll type fluid machinery according to Claim (3), characterized in that said hole (37) provided in said low pressure chamber forming unit is opened in a large size, and a discharge valve (30) is provided at said discharge port (29) on the bottom of said hole.

5. A scroll type fluid machinery according to Claim (1), characterized in that a seal member (35) is interposed on the outer peripheral surface of said low pressure chamber forming unit between the outer peripheral surface and the inner peripheral surface of said housing for the purpose of partitioning the inside of said housing into a high pressure chamber and a low pressure chamber.

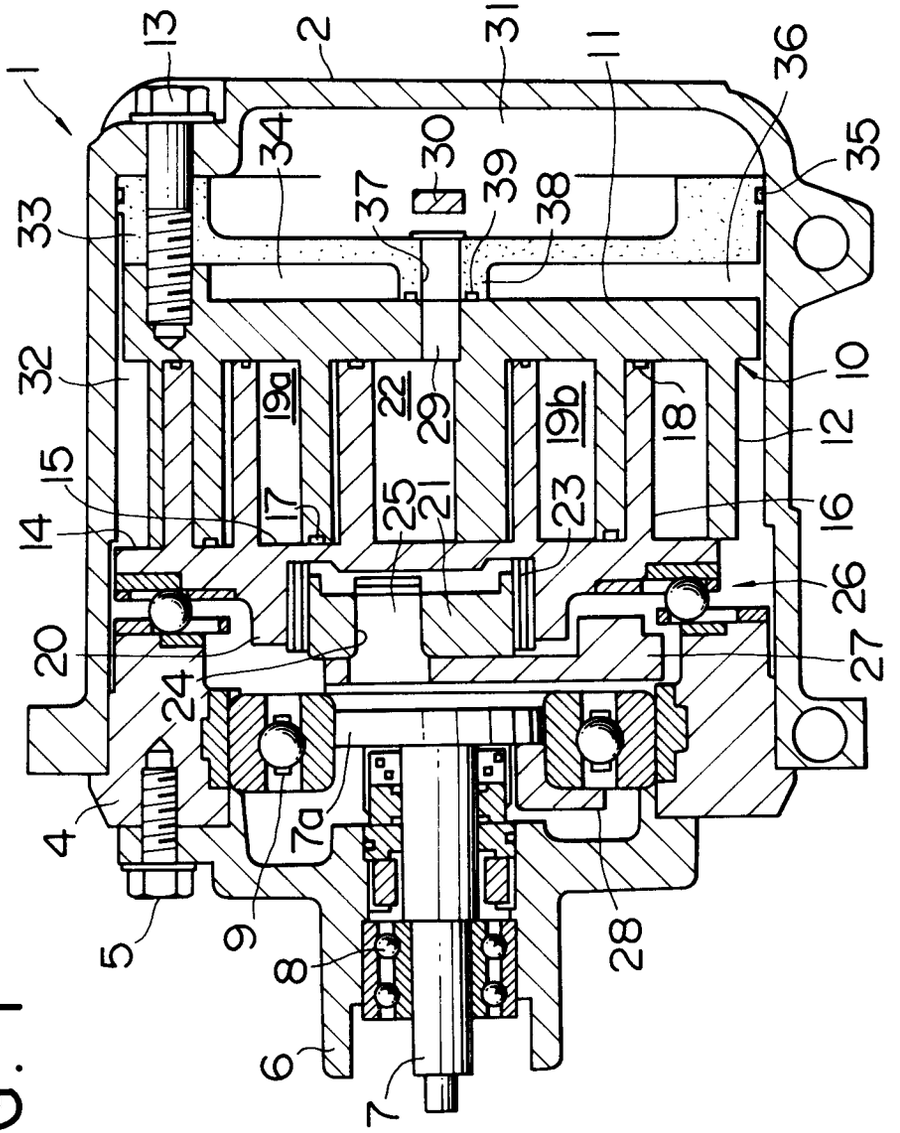
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FIG. 1

FIG. 2

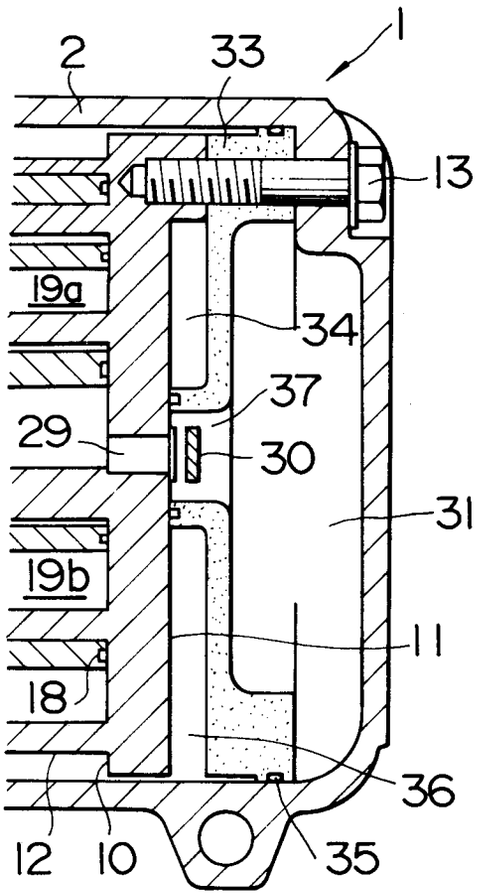
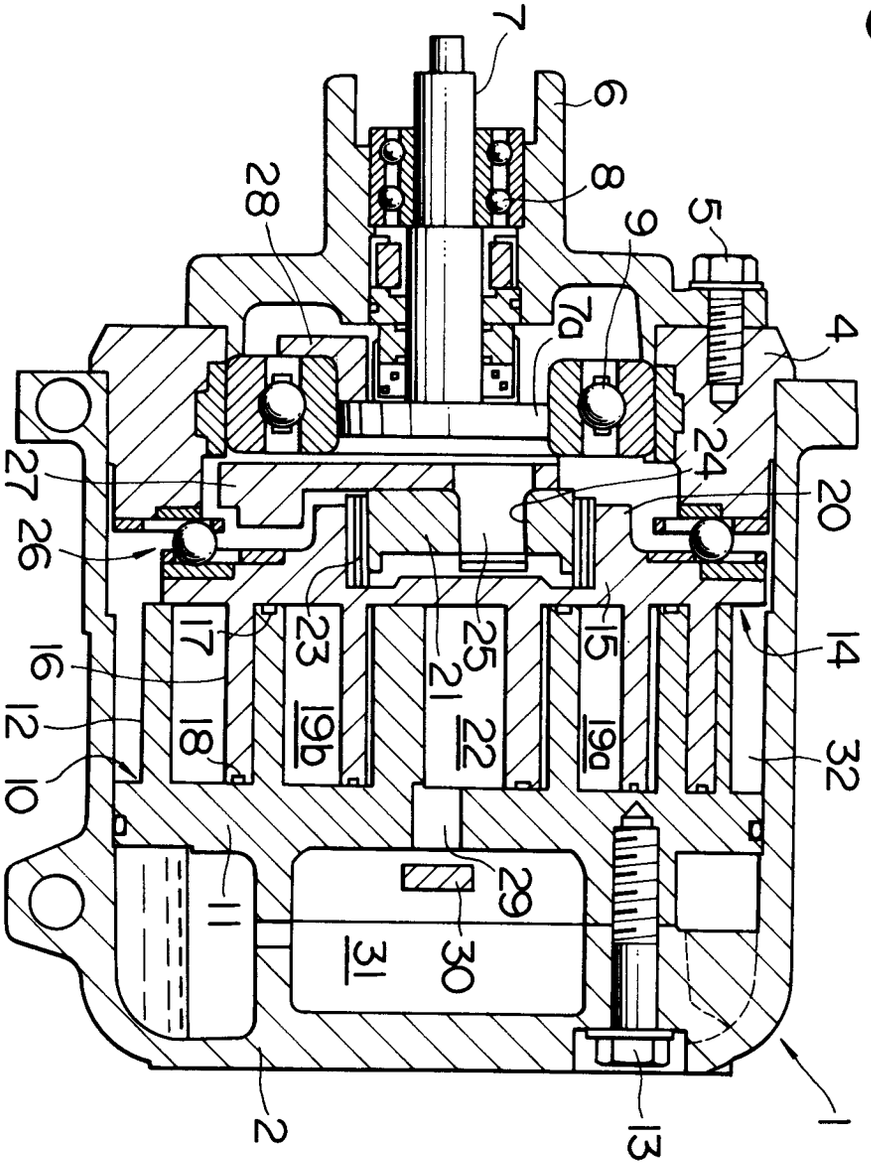


FIG. 3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EUROPEAN SEARCH REPORT

Application Number

EP 91 25 0154

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 13, no. 67 (M-798)(3415) 15 February 1989 & JP-A-63 268 992 (TOSHIBA CORP.) 7 November 1988 * abstract * *	1,3-5	F 04 C 18/02
A	GB-A-2 132 276 (COPELAND CORPORATION) * page 3, line 50 - page 4, line 13; figure 1 * *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 196 (M-497)(2252) 10 July 1986 & JP-A-61 040 473 (TOSHIBA CORP.) * abstract * *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 258 (M-838)(3606) 15 June 1989 & JP-A-1 063 678 (TOSHIBA CORP.) * abstract * *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 277 (M-519)(2333) 19 September 1986 & JP-A-61 098 987 (HITACHI LTD) * abstract * *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 14, no. 247 (M-978)(4190) 25 May 1990 & JP-A-2 067 485 (TOSHIBA CORP.) 7 March 1990 * abstract * *	1	F 04 C F 01 C

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	12 November 91	DIMITROULAS P.

CATEGORY OF CITED DOCUMENTS

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