June 23, 1970 TUNEO MONDEN ET AL 3,516,766

ROTARY COMPRESSOR

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FIG. 1

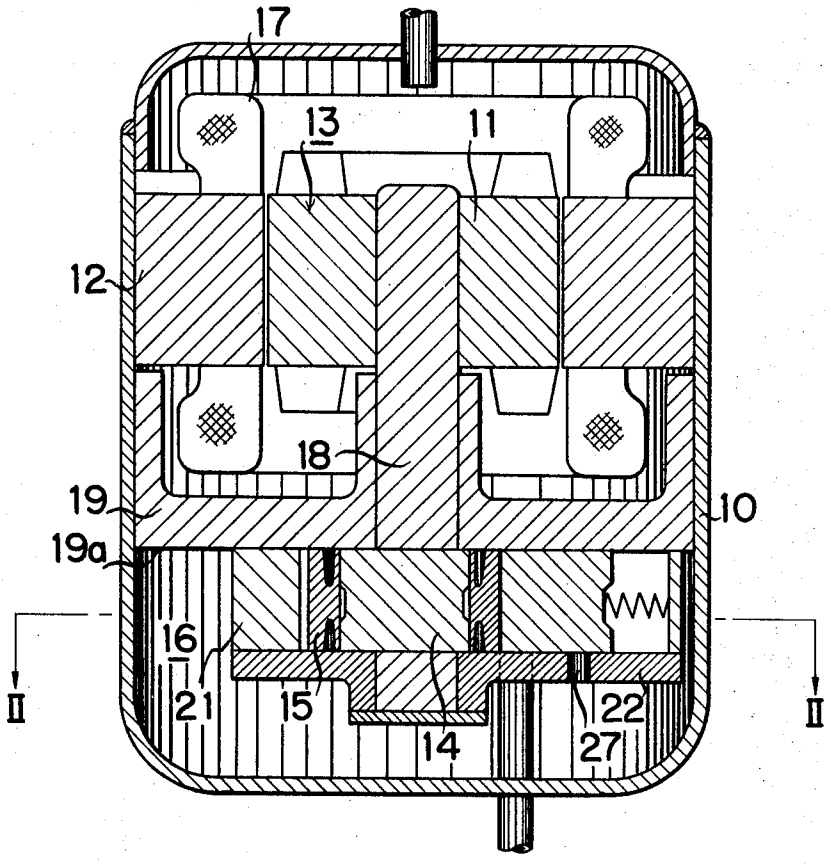
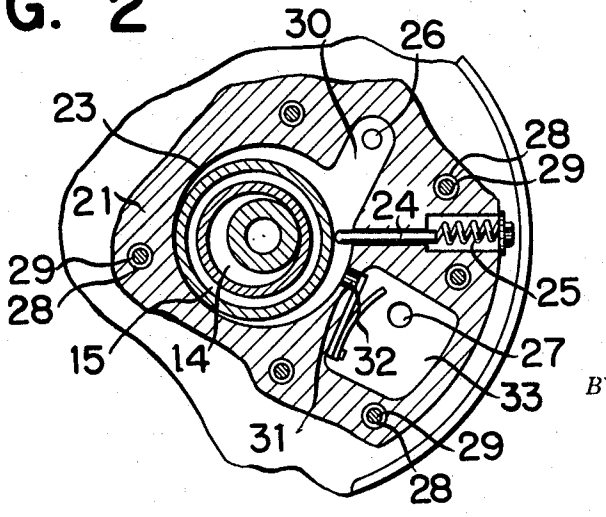


FIG. 2



BY

Tuneo Monden
Masao Ozu
Mahoto Watanabe

INVENTORS

Attorney

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FIG. 3

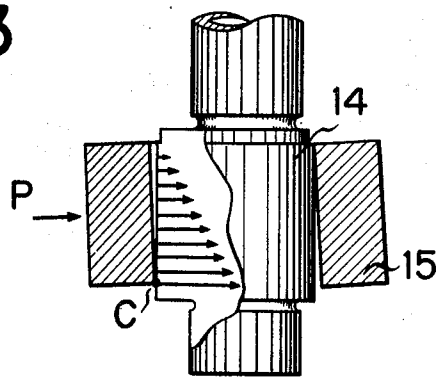


FIG. 4

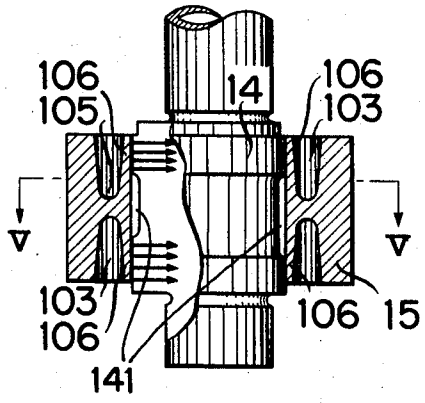


FIG. 5

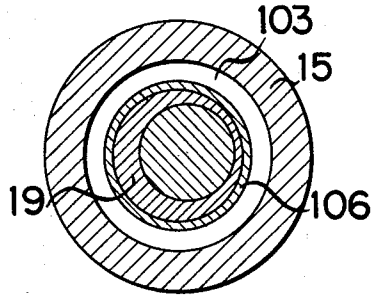
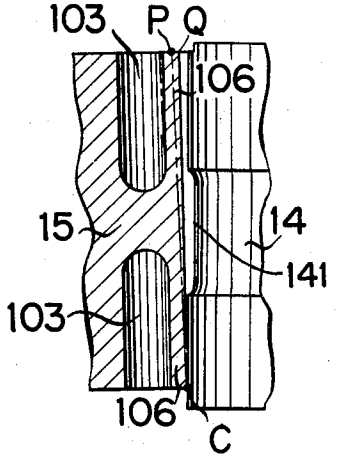


FIG. 6



Tuneo Monden
Masao Ozu
Makoto Watanabe

BY

INVENTORS

George B. Oujevolk
Attorney

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3,516,766

ROTARY COMPRESSOR

Tuneo Monden, Tokyo, Masao Ozu, Yokohama-shi, and Makoto Watanabe, Kawasaki-shi, Japan, assignors to Tokyo Shibaura Electric Co., Ltd., Kawasaki-shi, Japan, a corporation of Japan

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Claims priority, application Japan, Dec. 8, 1967, 42/78,404
Int. Cl. F04c 1/02, 17/02
U.S. Cl. 418—63 1 Claim

ABSTRACT OF THE DISCLOSURE

In a rotary compressor wherein a rotor supported by an eccentric is caused to roll along the inner periphery of a hollow cylinder, a pair of annular grooves extending axially from the opposite end surfaces of the rotor are provided near the inner periphery of the rotor to permit elastic deformation of the rotor periphery.

BACKGROUND OF THE INVENTION

This invention relates to a rotary compressor and more particularly to a motor driven rotary compressor for air conditioners and contained in a hermetically sealed casing.

This type of motor compressor comprising a driving motor inserted in the upper portion of the sealed casing, a flange supporting the shaft of the motor and a compressor located beneath the flange. The compressor comprises a cylinder, a rotor mounted on an eccentric of the motor shaft to eccentrically roll along the inner surface of the cylinder and a slide blade contained in a slot of the cylinder and urged against the outer periphery of the rotor by means of a spring whereby upon rotation of the rotor, gaseous refrigerant is sucked into a low pressure chamber in the cylinder, compressed and is then discharged into a condenser from a high pressure chamber. As the interior of the cylinder is divided into the low and high pressure chambers by the slide blade the contact surface between the inner surface and the outer surface of the eccentric would not become a uniform surface contact but instead the load concentrates to some portion causing excessive wear thereof. Operation over a long period under such concentrated load not only decreases the efficiency of gas compression but also applies an overload to the driving motor.

In accordance with this invention these troubles are eliminated by providing a pair of annular grooves axially extending from the opposite end surfaces of the rotor near the inner periphery thereof thus permitting elastic deformation thereof.

The outer diameter of the eccentric may be reduced at the central portion of the portion opposing the solid portion of the rotor between the bottoms of the annular grooves.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a longitudinal section of a motor compressor embodying this invention;

FIG. 2 shows a partial cross-sectional view of the compressor shown in FIG. 1 taken along a line II—II.

FIG. 3 is a partial view, partly in section to show the concentrated load at the contacting surface between the eccentric and the rotor of a prior art compressor;

FIG. 4 is a view, partly in section, of the rotor and eccentric showing the distribution of said pressure;

FIG. 5 is a cross-sectional view, taken along a line V—V in FIG. 4 and viewed in the direction of arrows; and

FIG. 6 is an enlarged view to show the elastic deformation of contacting surface between the eccentric and rotor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, a rotary compressor embodying this invention is shown as comprising a cylindrical hermetically sealed casing **10** in which is inserted a stator **12** of a motor **13**. The stator **12** is provided with a winding **17** to drive a rotor **11** having a shaft **18** journaled by a frame **19** also force fit in the sealed casing. A cylinder **21** of the compressor is clamped between the lower surface **19***a* of frame **19** and a lower end plate **22**. In a cylinder cavity **23** are contained an eccentric **14** of the motor shaft **18** and a rotor **15** encircling the eccentric **14**. A slide blade **24** is received in a slot cut in the cylinder **21**, which is normally urged against the periphery of the rotor by means of a spring **25**. Cylinder **21** has a suction port **30** communicating with a suction perforation **26**, an exhaust port **31** which is normally closed by a discharge valve **32** and a high pressure discharge chamber **33** communicating with a condenser through a discharge perforation **27**. As shown in FIG. 2 the lower end plate **22** is connected to the frame **19** by bolts **29** extending through bolt holes **28**.

With the prior construction, due to the above-mentioned side pressure P, the contact pressure between the rotor and the eccentric is not uniform as diagrammatically shown in FIG. 3. Thus the load is the highest at a point C causing undesirable wear at this point and undesirable overload of the driving motor.

As shown in FIGS. 4 and 5, according to this invention, outside diameter of the eccentric **14** is reduced about 0.1 to 1 mm., at the central portion over a length of about ⅔ of the total axial length and the rotor is provided with annular grooves **103** near its inner periphery, said annular grooves extending from opposite end surfaces of the rotor towards the axial center thereof.

In FIG. 4, the reduced portion of the outside diameter of the eccentric **14** is shown by the reference numeral **141**, portions adjacent to the bottom of said annular grooves **103** and said reduced portion **141** of the eccentric **14** being axially overlapped with respect to each other. In the arrangement shown, the eccentric **14** contacts only thin, inner peripheral walls **106** of the rotor **15** which are disposed adjacent to a pair of grooves and, therefore, the side pressure applied to the eccentric is uniformly distributed as illustrated by arrows in FIG. 4.

The operation of the novel compressor is a follows: When the rotor **15** is rotated by the electric motor to compress the gaseous refrigerant, load is concentrated at a point C shown in FIG. 6, by the side pressure acting upon the rotor **15** to deform the rotor as shown by CP, thus causing non-uniform contact between the rotor and the eccentric. However, annular grooves **103** permits elastic deformation of thin peripheral walls **106** between the annular grooves **103** and the inner periphery of the rotor thus causing the contact surface of the rotor to assume a position shown by CQ thus assuring uniform distribution of the side pressure in the eccentric **14**. Thus the undesirable effect of side pressure is alleviated to reduce local wear and smooth operation over a long time.

Since the solid portion **105** between the bottoms of annular grooves **103** does not undergo elastic deformation, the diameter of the eccentric opposing this portion is reduced to make more effective the elastic deformation. However, it will be clear that elastic deformation can be permitted to occur without reducing the diameter of the central portion of the eccentric. Further, it is clear that the pair of annular grooves **103** may be unsymmetrical.

While the invention has been shown and described in terms of a preferred embodiment it should be understood that many alterations and modifications will occur to those skilled in the art without departing from the true scope and spirit of the invention as defined in the appended claim.

What is claimed is:

1. In a rotary compressor comprising a cylinder including an inner peripheral wall; an eccentric, eccentrically disposed in said cylinder; a rotor, slidably contacting said inner peripheral wall and rotatably force fitted around the eccentric, and a slidable blade normally urged against said rotor; the improvement therein in that a pair of annular grooves are provided near the inner periphery of said rotor and extend axially from the opposite end surfaces of said rotor; and at the central portion of said eccentric, the outer diameter is such as to define a reduced portion thereat.

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WILLIAM L. FREEH, Primary Examiner

W. J. GOODLIN, Assistant Examiner

U.S. Cl. X.R.

417—424; 418—81