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(54) MEDIUM-FREQUENCY HERMETICALLY SEALED REFRIGERANT COMPRESSOR HAVING ACTIVATION AND UNLOADING FUNCTIONS

HERMETISCH ABGEDICHTETER MITTELFREQUENZ-KÄLTEMITTELKOMPRESSOR MIT AKTIVIERUNGS- UND ENTLADUNGSFUNKTIONEN

COMPRESSEUR DE FRIGORIGÈNE MOYENNE FRÉQUENCE HERMÉTIQUEMENT CLOS POURVU DE FONCTIONS D'ACTIVATION ET DE DÉCHARGEMENT

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Description

Technical Field

[0001] The present invention relates to the technical field of vapor cycle refrigerant system in a helicopter, and more specifically relates to a medium-frequency hermetically sealed refrigerant compressor capable of unloading during start.

[0002] Nowadays, a vapor cycle refrigerant system of a helicopter mainly comprises a compressor, a medium-frequency motor, an evaporator, a condenser, an evaporation fan, a condensing fan and an expansion valve. Motion transmission of the medium-frequency motor is achieved by a belt so as to drive the compressor to realize refrigeration. This method of driving the compressor has the following disadvantages: 1) motion transmission by using a belt occupies a large area of spaces and requires good positioning of the components and high precision with respect to installation; 2) the motor has an independent cooling mechanism which requires additional cooling fan and air ducts etc. to be provided, thereby resulting in undesirable bulkiness and heaviness; 3) tension of the belt and its limited service life requires additional maintenance and replacement. A hermetically sealed refrigerant compressor may effectively solve the above problems. However, a hermetically sealed refrigerant compressor according to prior art generally has a start current 5-7 times stronger than a working current. In an on-board device, such a strong start current will trigger power protection of the helicopter and thus causes power failure which is dangerous.

[0003] US 2 2018 521 A discloses a compression mechanism with a fluid tight enclosure divided into a motor compartment and a compressor compartment, a motor and a compressor being disposed in said compartments, respectively, wherein the compressor compartment provides a reservoir for lubricant, means for supplying lubricant to the compressor, communicating means between the outlet of the compressor and the motor compartment to conduct the compressed medium discharged by the compressor and lubricant to the motor compartment before the compressed medium and lubricant enters the compressor compartment.

[0004] US 1 826 172 discloses a power transmitting device with a housing of substantially tubular formation having a transversely extending web provided with a tubular portion constituting a bearing, a compressor shaft journaled in the bearing a split phase motor·within the housing and having a :rotor hub rotatable freely on said shaft and abutting· the bearing, and means substantially free from friction for transmitting motion positively from the rotor hub to the shaft at a one to one ratio after the rotor hub has accelerated from zero speed to a predetermined speed less than the normal running speed thereof. The device comprises only a sun gear fixed directly to the shaft and rotatable planet gears carried by the rotor hub and meshing with the sun gear, the planet gears being individually unbalanced but arranged symmetrically with respect to the axis of the shaft so that the gearing as a whole is always in balance.

Disclosure of the Invention

[0005] In view of the aforesaid disadvantages now existing in the prior art, the present invention provides a medium-frequency hermetically sealed refrigerant compressor capable of unloading during start. The medium-frequency hermetically sealed refrigerant compressor achieves a low current start.

[0006] In order to attain the above object, the medium-frequency hermetically sealed refrigerant compressor provided by the present invention comprises an electric connector, a front end socket, a rear end socket, a barrel, a medium-frequency motor provided inside the barrel, a movable disc, a motion transmission sleeve, a main shaft, a clutch coil and a clutch friction plate.

[0007] A front end and a rear end of the barrel are connected with the front end socket and the rear end socket respectively; a stator disc cooperating with the movable disc is fixed in the barrel; the movable disc and the stator disc are sleeved on one side of the main shaft; the clutch friction plate and the clutch coil are sleeved on another side of the main shaft; the movable disc and the clutch friction plate are fixed on a side surface of the main shaft; an output shaft of the medium-frequency motor is connected with the clutch coil via the motion transmission sleeve; the electric connector is fixed on the barrel; the electric connector is connected with the clutch coil.

[0008] The stator disc is fixed in the barrel by using screws.

[0009] A seal ring is provided between the stator disc and the side surface of the main shaft.

Beneficial effects of the present invention

[0010] The medium-frequency hermetically sealed refrigerant compressor capable of unloading during start provided by the present invention comprises an electric connector, a barrel, a medium-frequency motor provided inside the barrel, a movable disc, a motion transmission sleeve, a main shaft, a clutch coil and a clutch friction plate. During operation, the voltage value is lowered upon starting, and the medium-frequency motor drives the clutch coil to rotate via the motion transmission sleeve to achieve an unloaded start; when rotation of the medium-frequency motor becomes stable, the electric connector supplies power to the clutch coil so that the clutch coil and the clutch friction plate will be mutually attracted to each other; as such, the main shaft will be driven by the medium-frequency motor to rotate to achieve a low current start. With the same refrigeration capacity, the present invention uses a hermetically sealed structure so as to significantly reduce the size and weight of the vapor cycle refrigeration system. At the same time, the present invention achieves a low current start of the me-

dium-frequency hermetically sealed refrigerant compressor to reduce the impact against the on-board power supply.

Brief Description of Drawings

[0011] FIG. 1 is a structural view of the present invention.

[0012] In the figure, 1 refers to a front end socket, 2 refers to an electric connector, 3 refers to a medium-frequency motor, 4 refers to a movable disc, 5 refers to a stator disc, 6 refers to a rear end socket, 7 refers to a barrel, 8 refers to a motion transmission sleeve, 9 refers to a main shaft, 10 refers to clutch coil, and 11 refers to clutch friction plate.

Best Mode for Carrying out the Invention

[0013] The present invention will be described further in detail below with reference to the figure.

[0014] In FIG. 1, the medium-frequency hermetically sealed refrigerant compressor provided by the present invention comprises an electric connector 2, a front end socket 1, a rear end socket 6, a barrel 7, a medium-frequency motor 3 provided inside the barrel 7, a movable disc 4, a motion transmission sleeve 8, a main shaft 9, a clutch coil 10 and a clutch friction plate 11. A front end and a rear end of the barrel 7 are connected with the front end socket 1 and the rear end socket 6 respectively. A stator disc 5 cooperating with the movable disc 4 is fixed in the barrel 7. The movable disc 4 and the stator disc 5 are sleeved on one side of the main shaft 9. The clutch friction plate 11 and the clutch coil 10 are sleeved on another side of the main shaft 9. The movable disc 4 and the clutch friction plate 11 are fixed on a side surface of the main shaft 9. An output shaft of the medium-frequency motor 3 is connected with the clutch coil 10 via the motion transmission sleeve 8. The electric connector 2 is fixed on the barrel 7. The electric connector 2 is connected with the clutch coil 10. The stator disc 5 is fixed in the barrel 7 by using screws. A seal ring is provided between the stator disc 5 and the side surface of the main shaft 9. The clutch friction plate 11 is made by iron material.

[0015] The present invention has the following working principle: At first, power is not supplied by the electric connector 2 to the clutch coil 10, and the clutch coil and the clutch friction plate 11 are separated; next, activate the medium-frequency motor 3 so that the medium-frequency motor 3 drives the clutch coil 10 to rotate via the motion transmission sleeve 8; when rotation of the medium-frequency motor 3 becomes stable, the electric connector 2 supplies electricity to the clutch coil 10, and then the clutch coil 10 is magnetized by the received electricity; the clutch coil 10 and the clutch friction plate 11 will then be mutually attracted to each other to drive the main shaft 9 to rotate via the medium-frequency motor 3; the movable disc 4 at another side of the main shaft will then also rotate to achieve compression refrigeration.

Claims

1. A hermetically sealed refrigerant compressor suitable for the use in a helicopter and capable of unloading during start comprises an electric connector (2), a front end socket (1), a rear end socket (6), a barrel (7), a medium-frequency motor (3) provided inside the barrel (7), a movable disc (4), a motion transmission sleeve (8), a main shaft (9), a clutch coil (10) and a clutch friction plate (11)
   a front end and a rear end of the barrel (7) are connected with the front end socket (1) and the rear end socket (6) respectively; a stator disc (5) cooperating with the movable disc (4) is fixed in the barrel (7); the movable disc (4) and the stator disc (5) are sleeved on one axial side of the main shaft (9); the clutch friction plate (11) and the clutch coil (10) are sleeved on the other axial side of the main shaft (9); the movable disc (4) and the clutch friction plate (11) are fixed on an end portion of the main shaft (9); an output shaft of the motor (3) is connected with the clutch coil (10) via the motion transmission sleeve (8); the electric connector (2) is fixed on the barrel (7); the electric connector (2) is connected with the clutch coil (10).

2. The hermetically sealed refrigerant compressor capable of unloading during start according to claim 1, wherein the stator disc (5) is fixed in the barrel (7) by using screws.

3. The hermetically sealed refrigerant compressor capable of unloading during start according to claim 1, wherein a seal ring is provided between the stator disc (5) and the side surface of the main shaft (9).

Patentansprüche

1. Hermetisch abgedichteter Kältemittelverdichter, der geeignet zur Verwendung in einem Hubschrauber und in der Lage ist während des Starts entladen zu werden, umfassend einen elektrischen Verbinder (2), eine vordere Endbuchse (1), eine hintere Endbuchse (6), einen Zylinder (7), einen im Inneren des Zylinders (7) vorgesehenen Mittelfrequenzmotor (3), eine bewegliche Scheibe (4), eine Bewegungsübertragungshülse (8), eine Hauptwelle (9), eine Kupplungsspule (10) und eine Kupplungsreibplatte (11)
   wobei ein vorderes Ende und ein hinteres Ende des Zylinders (7) mit der vorderen Endbuchse (1) bzw. der hinteren Endbuchse (6) verbunden sind; eine Statorscheibe (5), die mit der beweglichen Scheibe (4) zusammenwirkt, in dem Zylinder (7) befestigt ist; die bewegliche Scheibe (4) und die Statorscheibe

(5) auf einer axialen Seite der Hauptwelle (9) mit einer Hülse versehen sind; die Kupplungsreibplatte (11) und die Kupplungsspule (10) auf der anderen axialen Seite der Hauptwelle (9) mit einer Hülse versehen sind; die bewegliche Scheibe (4) und die Kupplungsreibplatte (11) an einem Endabschnitt der Hauptwelle (9) befestigt sind; eine Ausgangswelle des Motors (3) über die Bewegungsübertragungshülse (8) mit der Kupplungsspule (10) verbunden sind; der elektrische Verbinder (2) an dem Zylinder (7) befestigt ist; wobei der elektrische Verbinder (2) mit der Kupplungsspule (10) verbunden ist.

2. Hermetisch abgedichteter Kältemittelverdichter, der in der Lage ist, sich während des Starts zu entladen gemäß Anspruch 1, wobei die Statorscheibe (5) in dem Zylinder (7) mittels Schrauben befestigt ist.

3. Hermetisch abgedichteter Kältemittelverdichter, der in der Lage ist, sich während des Starts zu entladen gemäß Anspruch 1, wobei ein Dichtungsring zwischen der Statorscheibe (5) und der Seitenfläche der Hauptwelle (9) vorgesehen ist.

Revendications

1. Compresseur de frigorigène scellé hermétiquement apte à être utilisé dans un hélicoptère et capable d'un déchargement au cours d'un démarrage, comprenant un connecteur électrique (2), une douille d'extrémité avant (1), une douille d'extrémité arrière (6), un barillet (7), un moteur de moyenne fréquence (3) prévu à l'intérieur du barillet (7), un disque mobile (4), un manchon de transmission de mouvement (8), un arbre principal (9), une bobine d'embrayage (10) et une plaque de friction d'embrayage (11),
une extrémité avant et une extrémité arrière du barillet (7) sont reliées respectivement à la douille d'extrémité avant (1) et à la douille d'extrémité arrière (6) ; un disque de stator (5) coopérant avec le disque mobile (4) est fixé dans le barillet (7) ; le disque mobile (4) et le disque de stator (5) sont emmanchés sur un côté axial de l'arbre principal (9) ; la plaque de friction d'embrayage (11) et la bobine d'embrayage (10) sont emmanchées sur l'autre côté axial de l'arbre principal (9) ; le disque mobile (4) et la plaque de friction d'embrayage (11) sont fixés sur une portion d'extrémité de l'arbre principal (9) ; un arbre de sortie du moteur (3) est relié à la bobine d'embrayage (10) via le manchon de transmission de mouvement (8) ; le connecteur électrique (2) est fixé sur le barillet (7) ; le connecteur électrique (2) est relié à la bobine d'embrayage (10) .

2. Compresseur de frigorigène scellé hermétiquement capable d'un déchargement au cours d'un démarrage selon la revendication 1, dans lequel le disque de stator (5) est fixé dans le barillet (7) en utilisant des vis.

3. Compresseur de frigorigène scellé hermétiquement capable d'un déchargement au cours d'un démarrage selon la revendication 1, dans lequel un anneau d'étanchéité est prévu entre le disque de stator (5) et la surface latérale de l'arbre principal (9) .

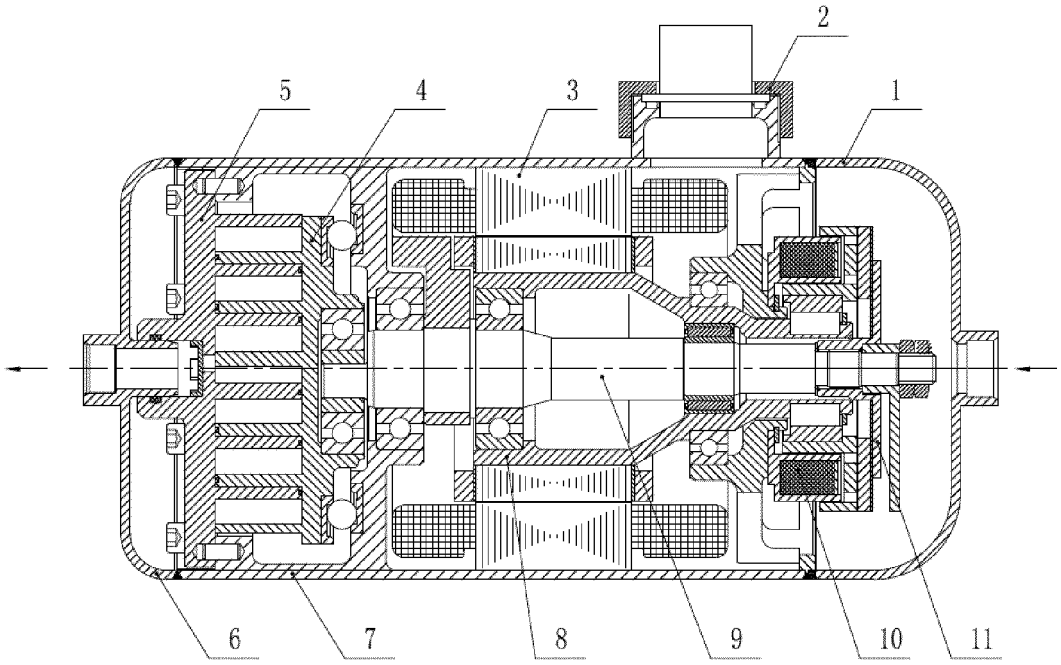


FIG.1

REFERENCES CITED IN THE DESCRIPTION

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