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[54] ROTARY MACHINES OF THE SLIDING VANE TYPE HAVING INTERCONNECTED VANE SLOTS

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[52] **U.S. Cl.** **418/77**; 418/238; 418/269
[51] **Int. Cl.**[2] **F01C 1/00**; F01C 21/00; F04C 17/00
[58] **Field of Search** 418/77, 236, 238, 253, 418/268, 269

[56] **References Cited**

UNITED STATES PATENTS

398,782	2/1889	Huson	418/268
706,158	8/1902	Charles	418/268
869,050	10/1907	Blackmer	418/269
1,144,258	6/1915	Smith	418/77
2,423,271	7/1947	Talbot	418/269
2,520,724	8/1950	Jessop	418/269

FOREIGN PATENTS OR APPLICATIONS

151,856	10/1920	United Kingdom	418/269
171,677	6/1906	Germany	418/238
317,845	5/1934	Italy	418/269

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[57] **ABSTRACT**

Improvement in rotary machines of the sliding-vane type, which have a stator housing, a rotor operatively mounted therein with vane slots to accommodate sliding vanes, is disclosed and comprises a series of channels provided on or in the rotor body and interconnecting the vane slots.

3 Claims, 5 Drawing Figures

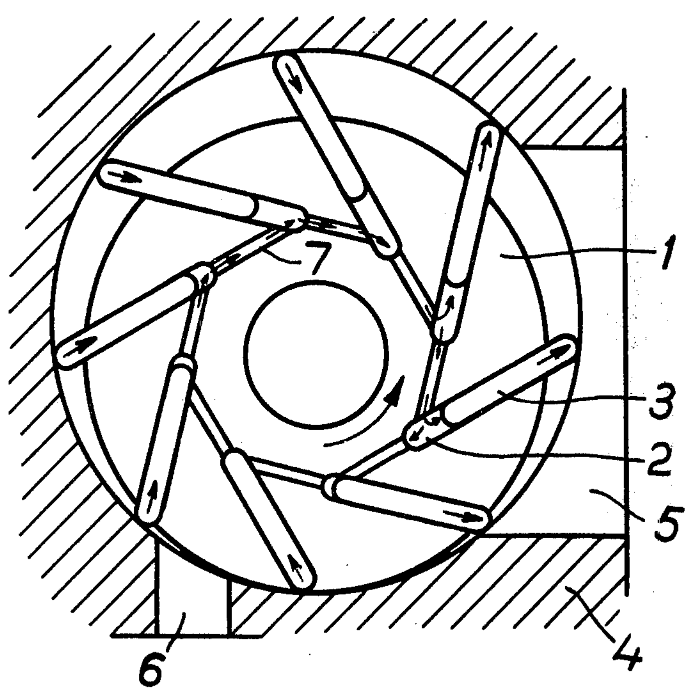


Fig. 1

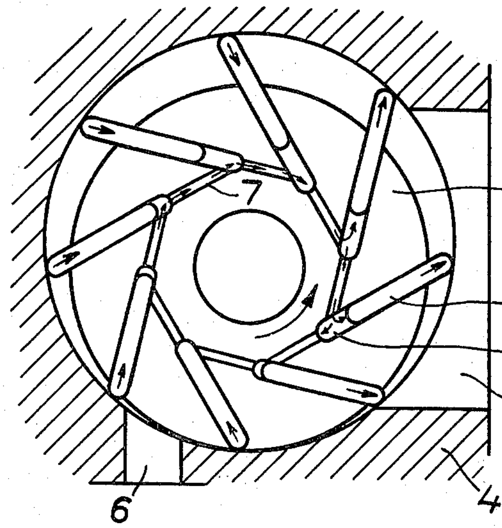


Fig. 2

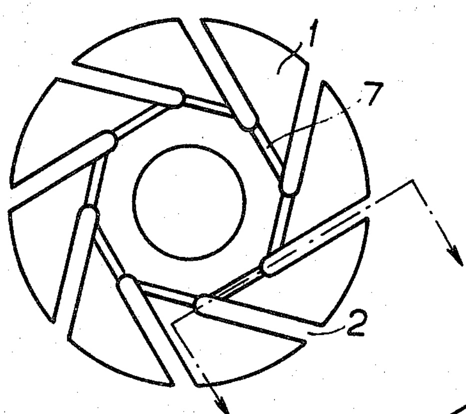


Fig. 3

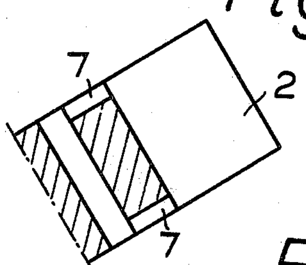


Fig. 5

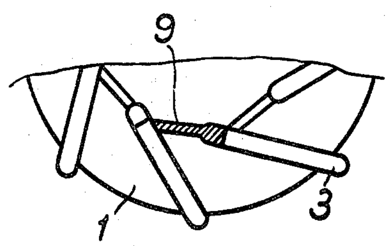
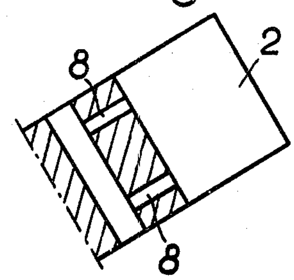


Fig. 4



ROTARY MACHINES OF THE SLIDING VANE TYPE HAVING INTERCONNECTED VANE SLOTS

BACKGROUND OF THE INVENTION

In the operation of conventional sliding-vane rotary machines typically compressors, the vanes slide in their respective rotor slots toward the inner surface of the stator and sequentially make contact therewith. During the rotary cycle, the sliding vanes are subjected to strongly varying forces such as gas pressure, centrifugal force, friction and acceleration. These forces may influence the sliding movement of the vanes to such an extent that they are retracted from, and then thrust outwardly against the inner surface of the stator with considerable force.

This behavior, known as "vane hopping," creates a knocking sound, causes denting and corrugation of the stator surface, and results in rapid and excessive wear of both the stator and the contacting vanes.

SUMMARY OF THE INVENTION

It is the primary object of this invention to provide a novel and effective means for preventing the "vane hopping" in sliding-vane rotary machines described above.

While other methods of reducing the sliding vane movements have been employed, the present invention achieves most satisfactory results in modulating excessive vane contact with the stator surface and eliminating rapid wear. In accordance with the concepts herein disclosed, suitably oriented and dimensioned channels are provided on or in the rotor body between adjacent vane slots, thus interconnecting the spaces in these slots which occur cyclically below the vanes. A flow of gas between the vane slots results, moderating the movement of the sliding vanes and creating smooth satisfactory contact between the tops of the vanes and the stator surface during the entire operating cycle.

The present invention will be further described with reference to the accompanying illustrative drawings, and defined by the accompanying claims.

DRAWINGS

In the drawings,

FIG. **1** is a cross-sectional view through the stator of a typical sliding-vane compressor constructed in accordance with this invention;

FIG. **2** is an elevational view of the rotor body of FIG. **1**;

FIG. **3** is a partial sectional view taken through the rotor of FIG. **2** along one of its vane slots;

FIG. **4** is a partial sectional view similar to FIG. **3** but showing an alternate embodiment; and

FIG. **5** is a partial elevational view of modified embodiment of the rotor of this invention.

DESCRIPTION

The sliding-vane compressor of FIG. **1** has rotor **1** provided with vane slots **2** and vanes **3**, as well as surrounding stator **4** with inlet opening **5** and outlet channel **6**. The rotor shaft is conventionally journalled in stator end sections (not shown) which also serve to enclose the compressor unit.

As clearly shown in FIGS. **1**, **2** and **3**, channel grooves **7** are formed on one or both surfaces of rotor body **1**, each connecting the inner bottom of a vane slot **2** with its adjacent vane slot **2**. In FIG. **1**, the arrows

shown on vanes **3** show the direction of movement of vanes **3** during rotation of the compressor, while the arrows in vane slots **2** and channels **7** indicate the corresponding gas flow therein. Suitable positioning and dimensioning of channel grooves **7**, as shown, produces a throttling of gas pressure below vanes **3** which balances the pressure influencing vanes **3** in the opposite direction; at the same time, a gas flow occurs which prevents the gas pressure below outwardly moving vanes **3** from falling too low to effectuate full vane operation.

The alternate embodiment of FIG. **4** has channel passages **8** formed within rotor body **1**, replacing the surface channels **7** of FIGS. **1–3** and serving exactly the same purpose.

The embodiment shown in FIG. **5** has channels **9** so located that the closing off of channels **9** by inwardly moving vanes **3** at a suitable moment of the operation cycle is ensured. During the continued inward movement of vanes **3**, the gas enclosed is compressed and thus acquires the counter-pressure necessary for satisfactory vane function.

What is claimed is:

1. A rotary machine of the sliding vane type, comprising:

a. a stator having an inner cylindrical surface;

b. a rotor eccentrically housed within said stator defining therebetween a working chamber having inlet and outlet passage means for a compressed fluid working medium;

c. a plurality of vane slots in said rotor extending from the central portion of said rotor outwardly to the peripheral surface thereof and being closed at their inner ends;

d. a vane mounted in each of said slots to move therein in an outward and inward direction in response to the increasing and decreasing volume of the working chamber to provide yieldingly sliding contact with the inner surface of the stator during the operating cycles of the rotor;

e. narrowed channels interconnecting said slots to provide restricted flow communication for the working medium from the inner closed end of the slots to a location on an adjacent slot spaced outwardly from the inner closed end thereof;

f. said channels being located so as to provide flow communication between two adjacent slots only during a predetermined movement of the vanes therein whereafter the vane by its inward movement interrupts flow through said channels and prevents communication between said two adjacent slots.

2. A rotary machine according to claim **1**, in which said channels extend from the bottom of one vane slot to an adjacent vane slot at a location having a radius greater than that corresponding to the bottom position of the innermost edge of the vane operating in said adjacent vane slot, and at a radius less than that corresponding to the outermost position of the innermost edge of the same vane.

3. A rotary machine according to claim **1**, in which said channels are effective to reduce fluid pressure beneath the inwardly moving vanes in response to the increased pressure exerted by the decreasing volume of the working chamber and to increase the pressure beneath the outwardly moving vanes in response to the increasing volume of the working chamber during the operating cycles of the rotor.

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