United States Patent

[11] 3,619,078

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[21] Appl. No. **48,358**
[22] Filed **June 22, 1970**
[45] Patented **Nov. 9, 1971**

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[54] **CENTRIFUGAL GAS COMPRESSOR**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **415/150**
[51] **Int. Cl.** **F04d 27/00,**
F04d 15/00
[50] **Field of Search** 415/148,
150, 151, 157, 158; 60/13

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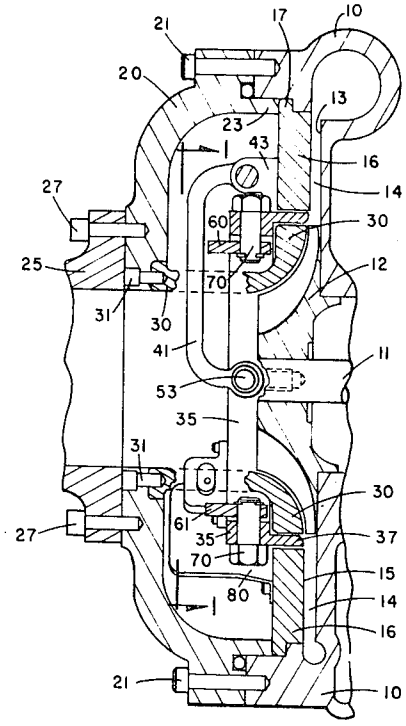
ABSTRACT: The annular diffuser valve of the centrifugal compressor is supported on two pairs of links or bars. One pair is disposed normal to the other pair. Like ends of the links are pivotally connected to the machine casing. The opposite ends of the links of each pair are pivotally connected to the valve at diametrically opposite sides thereof, whereby the valve is held concentric with the impeller for free linear movement across the diffuser passage. Power means is provided for imparting such linear movement to the valve.



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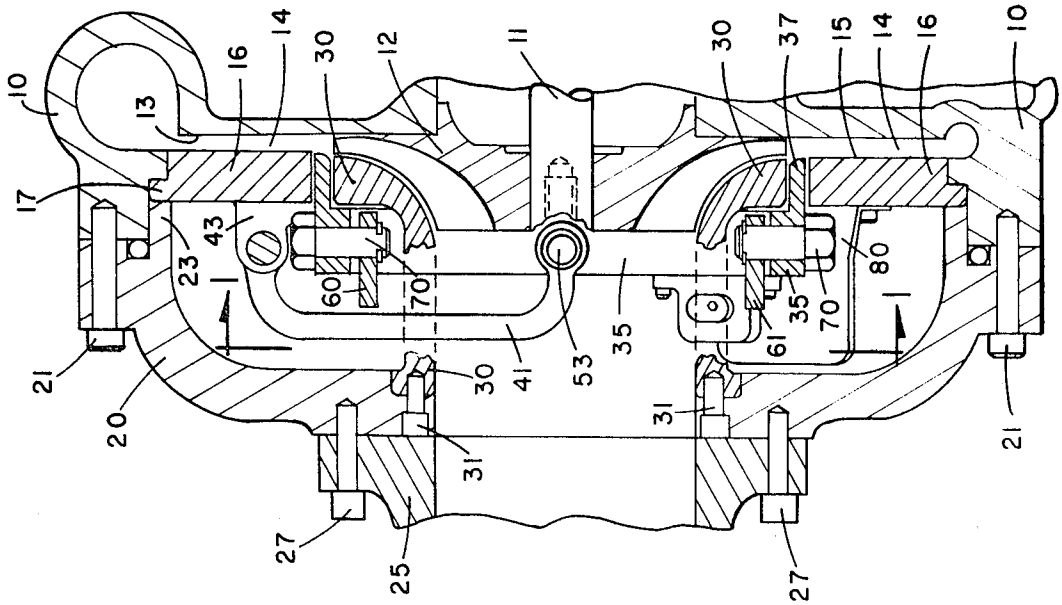

FIG. 2

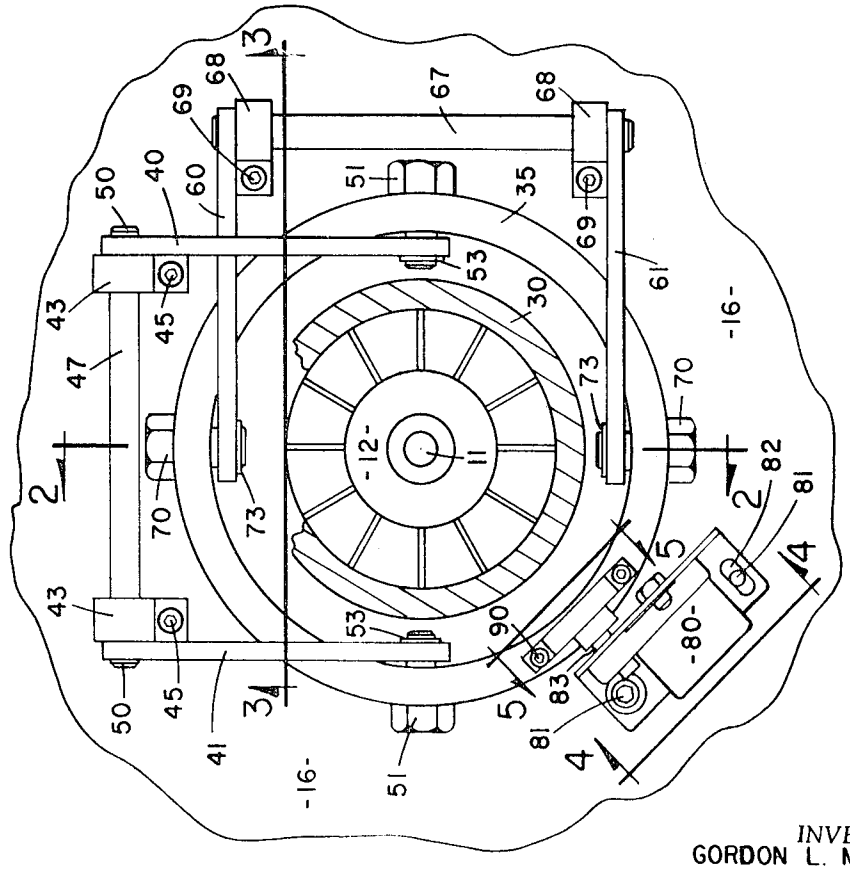

FIG. 1

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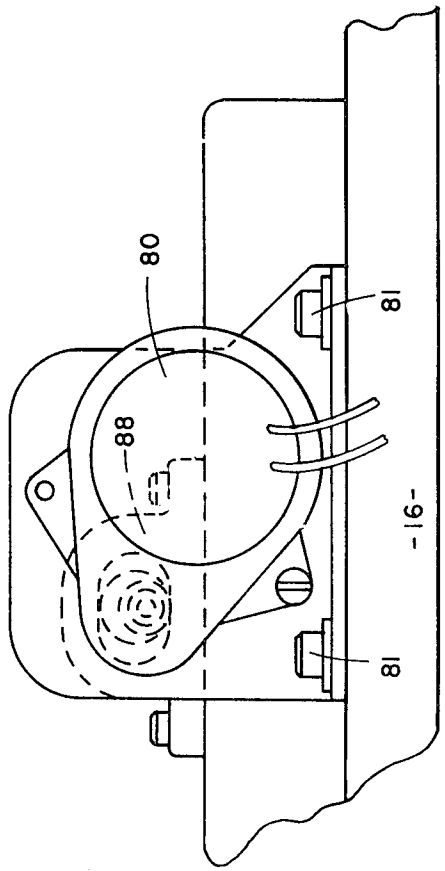

FIG. 4

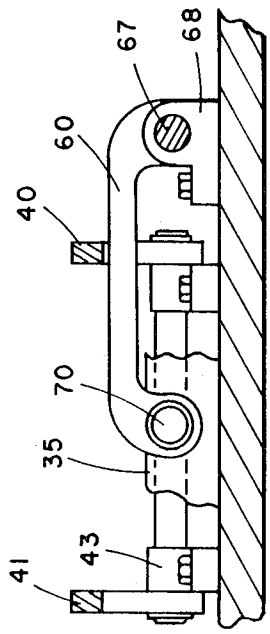

FIG. 3

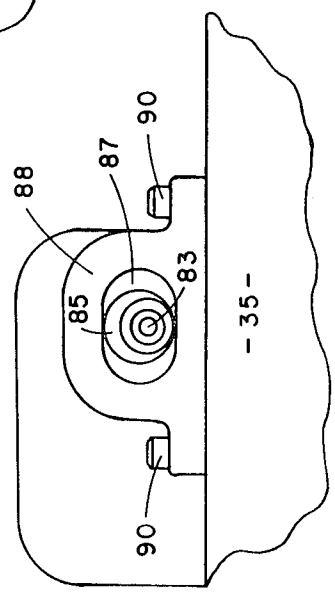

FIG. 5

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CENTRIFUGAL GAS COMPRESSOR

BACKGROUND OF THE INVENTION

The output or capacity of centrifugal gas compressors may be controlled by varying the flow of gas through the diffuser passage of the compressor as by movement of an annular diffuser valve transversely across the diffuser passage. Various arrangements have been employed for supporting such a valve and for moving the same for regulation of the compressor capacity. In one arrangement, the annular valve is slidably mounted on a series of guide pins fixed in the casing of the machine. In another construction, the valve is slidably mounted in a circular recess formed in a sidewall of the diffuser passage. In still another arrangement, the valve is mounted in such manner that upon relative rotation between the valve and a circular cam member, linear movement is imparted to the valve.

All of these constructions are complicated and costly to build and assemble in the compressor. A further disadvantage resides in the fact that the valves so mounted tend to cant and stick and become inoperable, requiring disassembly of a major portion of the machine to correct the difficulty.

Our invention has as an object a diffuser valve supporting and operating mechanism involving only a few parts of a simple form which are manufactured at an exceptionally low cost and which serve to support the valve for free movement without canting or binding and requiring only nominal power to effect such movement.

SUMMARY OF THE INVENTION

The diffuser valve is hung on two pairs of links. The links of each pair extend in spaced-apart parallel relation and are pivotally connected at like ends to the compressor casing. The links of one pair are disposed normal to the other pair. The opposite ends of the links of each pair are pivotally connected to the annular diffuser valve at diametrically opposite sides thereof. Accordingly, the valve is maintained concentric with the impeller transversely across the diffuser passage. A small power-operated actuator is provided for moving the valve.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, FIG. 1 is an end elevational view of the diffuser valve and the supporting mechanism, the view being indicated as by the line 1—1 of FIG. 2;

FIG. 2 is a sectional view taken diametrically through the disclosure in FIG. 1, as indicated by the line 2—2 and including contiguous portions of the compressor;

FIG. 3 is a partial sectional view taken as indicated by line 3—3 of FIG. 1;

FIG. 4 is an enlarged view taken on line 4—4 of FIG. 1; and

FIG. 5 is a view similar to FIG. 4 taken on line 5—5 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The general arrangement of the compressor is of conventional form including a housing 10 in which there is journaled a shaft 11 to which is affixed an impeller 12. The housing 10 forms one wall 13 of the diffuser passage 14. The opposite wall 15 of the diffuser passage is formed by an annular member 16 seated in a circular recess formed in the housing 10 and having a radial flange 17 against a shoulder formed in the housing. The machine further includes an outer housing section 20 fixedly secured to the housing 10 as by screws 21. The outer section 20 is formed with a cylindrical flange 23 which abuts against the flange 17 of the member 16 to fixedly secure the same to the housing 10. An outer intake manifold section 25 is fixedly mounted to the section 20 as by screws 27. An inner manifold section 30 is also fixed within the section 20 as by screws 31.

The annular diffuser valve 35 is formed with a cylindrical flange portion 37 positioned between the bore of the member 16 and the periphery of the inner end of the inner manifold section 30 (FIG. 2).

The valve 35 is supported by two pairs of links. Referring to FIG. 1, 40, 41 designates one pair of these links. It will be seen that the links are disposed in spaced-apart parallel relation; and like ends of these links 40, 41 are pivotally connected to the machine casing, specifically to the annular diffuser wall member 16. This connection is established by blocks 43 fixed to the member 16 as by screws 45. The blocks 43 are apertured to receive a shaft 47 having end portions extending beyond the blocks and to which the links 40, 41 are connected. REtaining members 50 applied to the ends of the shaft 47 restrain displacement of the links 40, 41 therefrom.

The opposite ends of these links are pivotally connected to the diffuser valve 35 as by screws 51 extending through the valve to receive the opposite ends of the links, which are retained against displacement by retaining rings 53 applied to the inner ends of the screws.

The supporting structure for the valve includes a second pair of links 60, 61. The second pair of links are pivotally connected to the member 16 and to the valve 35 in like fashion to the connection for the links 40, 41. Referring again to FIG. 1, it will be seen the links 60, 61 are also disposed in spaced parallel relationship with like ends pivotally connected to the member 16 by shaft 67 mounted in blocks 68 fixed to the member 16 by screws 69. The second pair of links 60, 61 are disposed normal to the links 40, 41; and the pivotal connection between the inner ends of these links and the valve 35 is by way of screws 70. The screws 51, 70 are mounted in the valve 35 at diametrically opposite sides thereof, the screws 70 being displaced circumferentially on the valve 35 90° from the screws 51. Retaining members 73 are employed to prevent displacement of the inner ends of the links 60, 61 from the screws 70.

The links 40, 41 and 60, 61 are curved at their ends whereby the main connecting portion of the links is offset from the mounting pivots 47, 67, 51, 70. It will be observed, referring to FIGS. 2 and 3, the links 40, 41 are formed with a greater offset than the links 60, 61 inasmuch as one of the links 40, 41 has to be disposed above the links 60 or 61 of the other pair.

With this arrangement, it will be apparent that the diffuser valve 35 hangs perfectly normal to the axis of the impeller concentrically thereto and for free movement in an axial direction of the impeller transversely of the diffuser passage 14. With this arrangement, there is no possibility of a diffuser valve canting or binding.

To effect movement of the valve transversely of the diffuser passage, a small motor 80 is fixedly mounted on the member 16 as by screws 81 extending through elongated apertures 82 formed in the motor base and threading into the member 16. (See FIG. 1) The motor includes a suitable gear reduction and has an output shaft 83 to which there is affixed a cam 85. (See FIG. 5.) The cam is positioned in an elongated aperture 87 formed in a block 88 fixed to the valve 35 as by screws 90. The motor 80 is of the reversible type; and upon energization of the motor, effecting rotation of the cam 85, it will be apparent that the valve member 35 is moved transversely across the diffuser passage 14.

We claim:

1. A centrifugal gas compressor including a casing, an impeller journaled in said casing, said casing being formed with a diffuser passage encircling said impeller and extending outwardly therefrom, an annular diffuser valve disposed for movement transversely of said diffuser passage to control the flow of gas through said passage, mechanism for reciprocating said valve for movement transversely across said diffuser passage, said mechanism comprising a first pair of links extending in spaced-apart parallel relation, said links being pivotally connected at like ends to said casing outwardly from said valve, said links being pivotally connected at their opposite ends to said valve at diametrically opposite sides thereof, a second pair of like links pivotally connected in like manner to said casing and said valve, the links of said second pair extending in a direction normal to the links of said first pair, the pivotal connection between the links of said second

pair and said valve being spaced circumferentially of said valve 90° from such connections of the links in said first pair, whereby said valve is supported and maintained in concentric relation to said impeller by said links for axial movement in a linear path transversely of said diffuser passage, and power valve operating means connected to said casing and operable to effect such movement of said valve.

2. A centrifugal gas compressor as set forth in claim 1 wherein said casing includes an annular member forming a wall of said diffuser passage, said like ends of said links being pivotally connected to said annular member.

3. A centrifugal gas compressor as set forth in claim 1 wherein said casing includes an annular member forming a wall of said diffuser passage, and said power valve operating means includes a prime mover fixedly mounted on said annular member and motion transmitting means operatively connecting said prime mover to said valve.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,619,078 Dated November 9, 1971

Inventor(s) GORDON L. MOUNT & JAMES W. ENDRESS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 39, after "impeller" insert --for free movement in a direction axially of the impeller--

Signed and sealed this 30th day of May 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334