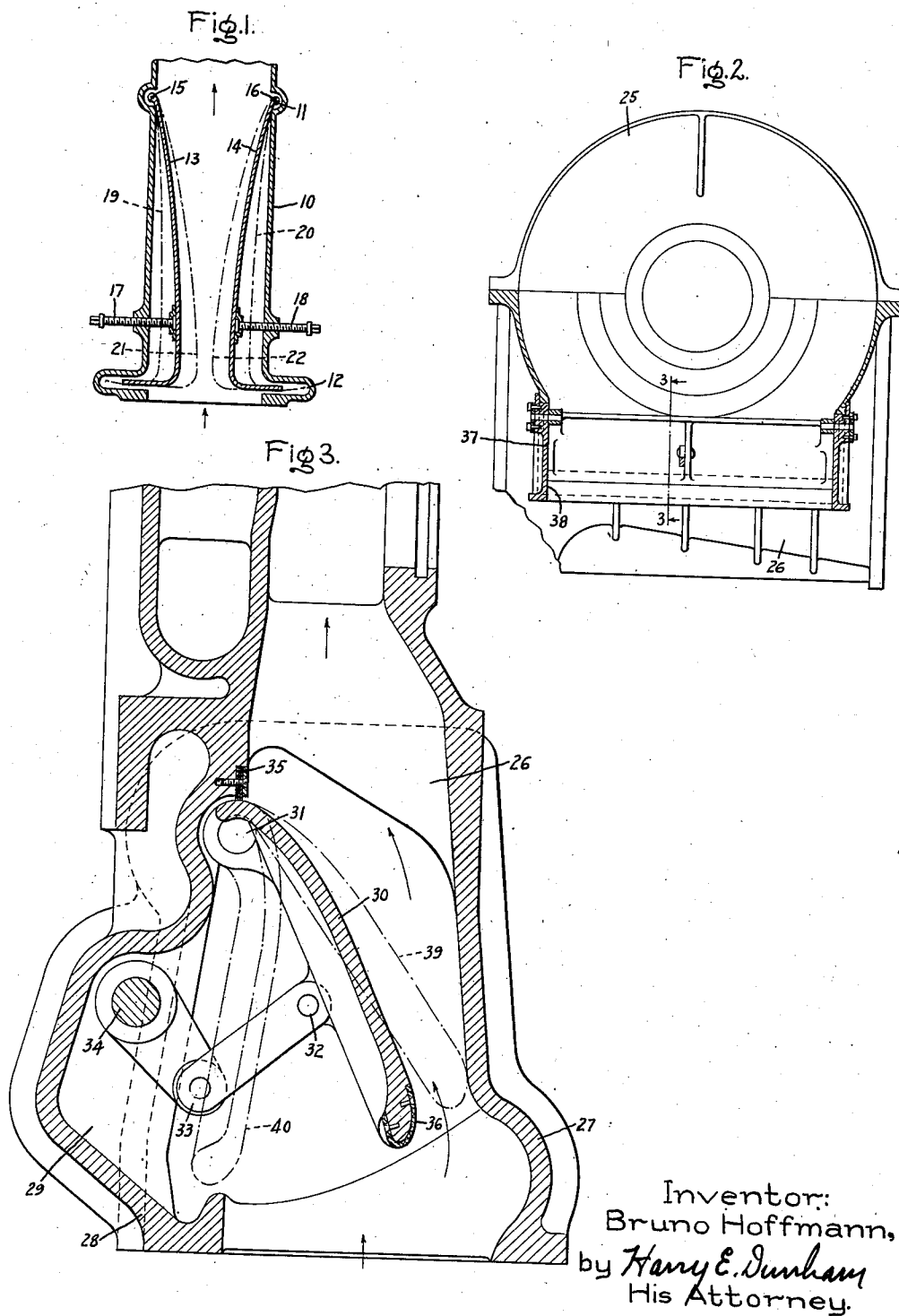


June 8, 1937.

B. HOFFMANN
CENTRIFUGAL COMPRESSOR

2,083,447

Filed April 25, 1935



UNITED STATES PATENT OFFICE

2,083,447

CENTRIFUGAL COMPRESSOR

Bruno Hoffmann, Berlin, Germany, assignor to
General Electric Company, a corporation of
New York

Application April 25, 1935, Serial No. 18,203
In Germany May 12, 1934

3 Claims. (Cl. 230-114)

The present invention relates to centrifugal compressors or blowers, more specifically to the kind of compressors in which the output is controlled by valve means disposed in the inlet or suction conduit of the compressor. The provision of such valve means serves to restrict the effective opening area in the suction conduit in order to change the flow of air or like gas from the atmosphere or like low pressure source to the compressor. The restriction of the opening area in many cases leads to pulsation and also causes a considerable increase in velocity of the medium flowing through the suction conduit. In the ordinary arrangement the available energy due to such increased velocity is lost.

The object of my invention is to provide an improved construction and arrangement of the type of compressors specified above whereby the output of the compressor may be effectively controlled, pulsations reduced and the efficiency increased. This is accomplished in accordance with my invention by the provision of means for throttling the supply in the inlet conduit, which means is arranged to form a nozzle or diffuser in order to transform the increased velocity of the throttled medium into pressure whereby the available energy of the high velocity medium is regained. The nozzle or diffuser may be formed by adjustable walls of the inlet or the suction conduit or of the casing near the entrance to the suction conduit. A particularly simple arrangement is obtained by the provision of a vane or adjustable wall which in combination with an oppositely lying wall portion of the inlet conduit forms a diffuser.

In the accompanying drawing, which shows two embodiments of my invention, Fig. 1 is a somewhat diagrammatic view of a suction conduit of a compressor in accordance with my invention; Fig. 2 illustrates a modification of my invention; and Fig. 3 is an enlarged sectional view along line 3-3 of Fig. 2.

The arrangement shown in Fig. 1 comprises an inlet or suction channel 10 having spaced-apart longitudinal recesses 11 and 12 on opposite sides. Two diffuser walls 13 and 14 are disposed on opposite sides within the channel 10. The upper ends of the walls 13 and 14 are disposed within the recesses 11 and secured to the walls of the channel 10 by means of pivots 15 and 16 respectively. The lower ends of the walls 13 and 14 are bent outward and project into the recesses 12 of the opposite walls of the channel 10. Intermediate portions of the walls 13 and 14 are secured to the ends of adjustable bolts 17 and 18

respectively. These bolts are screwed into wall portions of the channel 10 to permit positioning of the diffuser walls 13 and 14. The dash-dotted lines 19 and 20 indicate the positioning of the diffuser walls in which they form a maximum opening area. Other dash-dotted lines 21 and 22 indicate the diffuser walls in a position in which they considerably restrict the effective opening area of the inlet conduit, that is, during low load and starting condition of the compressor. During operation of the compressor air or like gas at relatively low pressure is forced into the inlet channel in the direction of the arrows. Small effective opening area of the diffuser causes an increase in velocity of the air stream. The increased velocity as it passes through the diffuser is transformed into pressure. The arrangement, as stated above, thereby increases the efficiency of the compressor, reduces pulsations during low load and provides for a smooth, continuous flow of air or like medium through the suction conduit.

The arrangement shown in Figs. 2 and 3 comprises a compressor 25 having an inlet channel 26 somewhat rectangular in section. The walls of the inlet channel include a front wall 27 and a rear wall 28. The rear wall is shaped to form a recess 29 for accommodating a vane or wall 30 adjustably held at its upper end by means of a pivot 31. An intermediate portion of the vane 30 is connected by a pivot 32 to a link mechanism 33. The end of the link mechanism is securely held on a rotatable shaft 34 which latter can be turned or adjusted externally of the inlet conduit. A packing 35 is secured to the rear wall 28 to reduce back flow of air or like medium through the recess 29. Another packing 36 is secured to the lower end of the vane 30 whereby complete sealing of the interior of the compressor may be effected when the lower end of the vane 30 with the packing 36 is moved into contact with the front wall 27. The end surfaces 37 of the vane 30 are machined and disposed in close proximity to the machined end surfaces 38 of the side walls of the inlet conduit in order to reduce leakage between these adjacent surfaces, especially when the vane is in position to completely shut the inlet conduit. The complete sealing facilitates starting of the compressor. In the present instance the vane 30 is shown in full lines in an intermediate position, in dash-dotted lines 39 in closed position, and in other dash-dotted lines 40 in full open position. The flow of air or like medium is indicated by arrows in Fig. 3. The vane 30 is moved towards

closing position as the load demand decreases and during starting in order to reduce the effective opening area of the inlet conduit. The velocity of the air as it passes through the narrow portion of the diffuser formed by the vane 5 30 and the front wall 27 is increased, and the increased velocity energy thus obtained is transformed into pressure energy as the air passes through the wide flaring portion of the diffuser.

10 What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A centrifugal compressor including a suction conduit and a diffuser in the suction conduit for controlling the flow of a medium there- 15 through and for preventing a reduction in inlet pressure with decreasing load, said diffuser including a member having a portion pivotally secured to the wall of the suction conduit and positioning means connected to another portion 20 of the member, movement of said member to reduce the flow causing simultaneously increased diffuser action.

2. A centrifugal compressor including a suction conduit and a diffuser in the suction conduit

for controlling the flow of a medium there- through and for preventing a reduction in inlet pressure with decreasing load, said diffuser in- cluding a member having a portion pivotally se- 5 cured to the wall of the suction conduit, posi- tioning means connected to another portion of the member, to move the member in order to reduce the effective cross-section of the conduit in response to decreasing load demand, and seal- ing means for reducing leakage of fluid into the 10 compressor while said member is in closed posi- tion.

3. A centrifugal compressor including a suc- tion conduit substantially rectangular in cross section, two curved vanes having end portions 15 pivotally held on opposite walls of the conduit, and adjustable means connected to other por- tions of the vanes for controlling the effective opening area of the conduit to effect increased diffusion with increased throttling in order to 20 prevent reduction of the inlet pressure with de- creasing load, the conduit having recesses form- ing guides for the vanes.

BRUNO HOFFMANN.