NOISE ATTENUATING MEANS FOR THE DISCHARGE OF A COMPRESSOR

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3 Claims

ABSTRACT OF THE DISCLOSURE

Noise attenuating means for a compressor discharge, a flexible diaphragm peripherally clamped and responsive to high pressure from a compressor discharge to flex towards a mitral wall and momentarily substantially block the flow of discharge fluid to the discharge pipe to decrease the pressure in the discharge pipe at the time of greatest discharge pressure from the compressor, the high pressure trapped by the diaphragm having restricted flow to the discharge pipe through or past the diaphragm when the compressor discharge valve is closed, thereby more nearly equalizing the pressure in the discharge pipe, resulting in a decrease in peak pressures and a consequent lowering of the discharge noise level.

DESCRIPTION OF THE INVENTION

This invention relates to compressors and more particularly to means for limiting or attenuating the noise level at the compressor discharge.

Normally, the discharge pressure of a compressor, particularly a refrigeration compressor, follows a sinusoidal pattern as the discharge pulsates in the discharge line in response to the stroke of the compressor piston and the action of the discharge valve. If there is no muffling in the discharge line, the high and low pressure pulse peaks create an undesirable noise level which can be reduced if the peak pressures can be attenuated and it is an object of the present invention to provide means in the discharge line of a refrigeration compressor for attenuating or reducing the pressure pulse peaks to thereby lower or limit the noise level of the compressor.

Broadly, the foregoing object is accomplished by providing in the compressor discharge line a normally open restrictor which is moved in response to discharge pressure pulsations to a position restricting the discharge so that the system pressure downstream of the restrictor falls relative to the discharge pressure upstream of the restrictor and the latter retains the discharge pressure until the compressor commences its suction stroke and the discharge valve is closed. Upon this occurrence metering orifices through the restrictor permit it to return to its normal open position for free passage of the compressed refrigerant into the reduced pressure of the discharge line and this has the effect of cutting off the pressure peaks of the pulsations to effect a reduction in noise level.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of the restrictor of the invention;
FIG. 2 is a view similar to FIG. 1 but showing the restrictor in change position in response to discharge pressure pulsation of a compressor and
FIG. 3 is a vertical elevational view of a variable diaphragm embodying features of the invention.

Referring now to the drawings, the numeral 10 designates the discharge head of a compressor having a passage 12 therein communicating with the discharge valve (not shown) of the compressor. The passage 12 leads into a cavity 14 defined by an annular recess 16 in the head part 10 and one side of a flexible diaphragm 18 whose peripheral edge is clamped between the head 10 and a cover member 20 having an annular recess 22 therein which defines with the opposite side of the diaphragm a second cavity 24 which is connected to the refrigeration system by way of a discharge pipe 26.

The diaphragm 18 is provided with a central opening 27 and the recesses 14 and 24 surround conical or tapered bosses 28, 30, respectively, which abut each other and receive a bolt 32 which attaches the cover member 20 to the compressor head 10. As can be seen, the bosses 28, 30 define bevelled or mitral walls 34, 36 which are co-axial with and extend through the central opening 27 of the diaphragm 18. As can be seen, the central opening 27 has a larger diameter than the meeting faces of the bosses 28, 30 but when the diaphragm is flexed to the left by full discharge pressure of the compressor the inner annular edge 40 of the central diaphragm opening 27 moves into close proximity to the mitral surface 36 of the left hand boss 30, thus impeding the passage of pressurized vapor from the cavity 14 on the right hand side of the diaphragm in FIG. 1 to the discharge pipe 26 on the left hand side.

In FIG. 1, the equalizer diaphragm 18 is shown in a neutral position as would be the case were there uniform flow whereby compressed vapor would freely and uninterrupted through the annular passage between the annular edge of the diaphragm opening 27 and the abutting ends of the bosses 28, 30. However, because flow from a reciprocating piston compressor is not uniform but is in the form of pressure pulses which are most pronounced in the system, the maximum pressure is greatest during the discharge portion of the piston stroke the diaphragm assumes the flexed position of FIG. 2. It can be seen that due to the mitral or bevelled profile 36 of the boss 30, the flow orifice through the opening 27 of the diaphragm is restricted and therefore the pressure in the pipe 26 downstream of the orifice is reduced. Conversely, during the suction portion of the piston stroke when gas flow stops momentarily, the diaphragm flexes back to its normal position of FIG. 1 and the retained pressure upstream of the diaphragm 18, that is to say, the pressure in the cavity 14 on the right hand side of the diaphragm in FIG. 1 is relieved through the restricted passage between the inner edge 40 of the diaphragm and the surface 36 of the boss 30, thus minimizing pressure variations downstream of the diaphragm.

From the foregoing, it will be understood that the compressed vapor pulsations are modulated by the action of the restrictor diaphragm to vary the flow orifice and thus provide automatic, variable metering of the discharge. Desirably, the restrictor diaphragm is provided with the ability to sense pressure differential across itself by means of small bleed holes 42 which enable the diaphragm to maintain the optimum orifice capacity in order to most effectively modulate the pressure pulsation.

It is believed that the foregoing description of the structure and mode of operation of the invention should be sufficient for one skilled in the art to fully understand the nature of the invention and no further description is therefore required.

What is claimed is:

1. Means for attenuating noise at the discharge of a compressor comprising a body member having inlet and outlet ports therein adapted to be connected to a compressor discharge valve and to a discharge pipe respectively, a cavity in the body member, a flexible diaphragm peripherally connected to the body member and dividing the cavity into a first chamber connected to the inlet port and a second chamber connected to the outlet port, a central opening through said diaphragm, and an annular mitral wall in said second chamber having a central part spaced from the edge of said diaphragm opening to...
provide a fluid passage between said central part and the edge of said opening, said mitral wall sloping outwardly into said second chamber and cooperating with the edge of the diaphragm opening to restrict fluid passage between said edge and mitral wall upon an increase of pressure in said first chamber sufficient to flex said diaphragm towards said second chamber.

2. The noise attenuating means of claim 1 including a central boss in said second chamber tapering co-axially toward said opening, said mitral wall being defined by the outer surface of said boss.

3. The noise attenuating means of claim 2 including a second tapered boss in said first chamber similar to and co-axial with the first boss, the confronting ends of said bosses engaging each other through the opening in said diaphragm.

4. The noise attenuating means of claim 1 including restricted bleed opening means through said diaphragm separate from said first opening for the controlled release to the second chamber and said discharge port of high pressure fluid from said inlet port trapped in said first chamber due to flexing of said diaphragm into flow restricting relationship with said mitral wall.

5. The noise attenuating means of claim 3 wherein the body member is composed of two substantially complementary confronting halves, a fastening element extending co-axially through said bosses connecting said halves together, the peripheral edge of said diaphragm being clamped between the confronting outer edges of said halves.

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Disclaimer


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