

[54] **SUCTION MUFFLER TUBE FOR
COMPRESSOR**

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[58] Field of Search 417/313, 312, 415;
181/36 R, 35 A; 62/296; 415/119; 123/198 E

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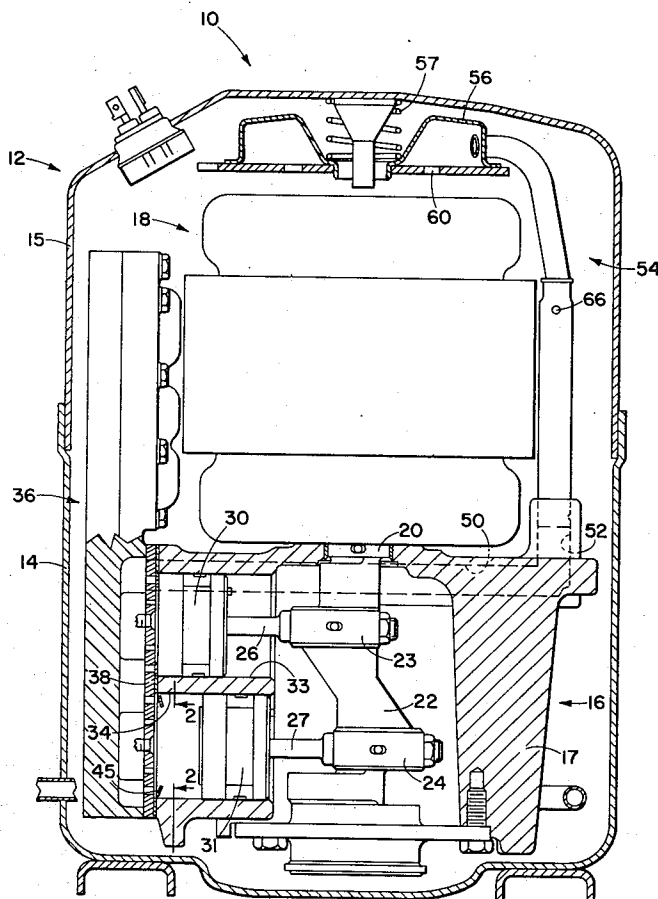
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[57] **ABSTRACT**

A gas compressor having a suction muffler assembly for attenuating both high and low frequency noise produced by the inlet valving of the compressor, including an inner suction tube extending from the compressor intake to a muffler and a by-pass tube surrounding the suction tube with the by-pass tube having by-pass apertures in the upper end thereof, whereby the effective cross-sectional area of the suction intake tube may be reduced thereby attenuating low frequency noise while at the same time retaining adequate gas inflow to the compressor intake.

4 Claims, 5 Drawing Figures



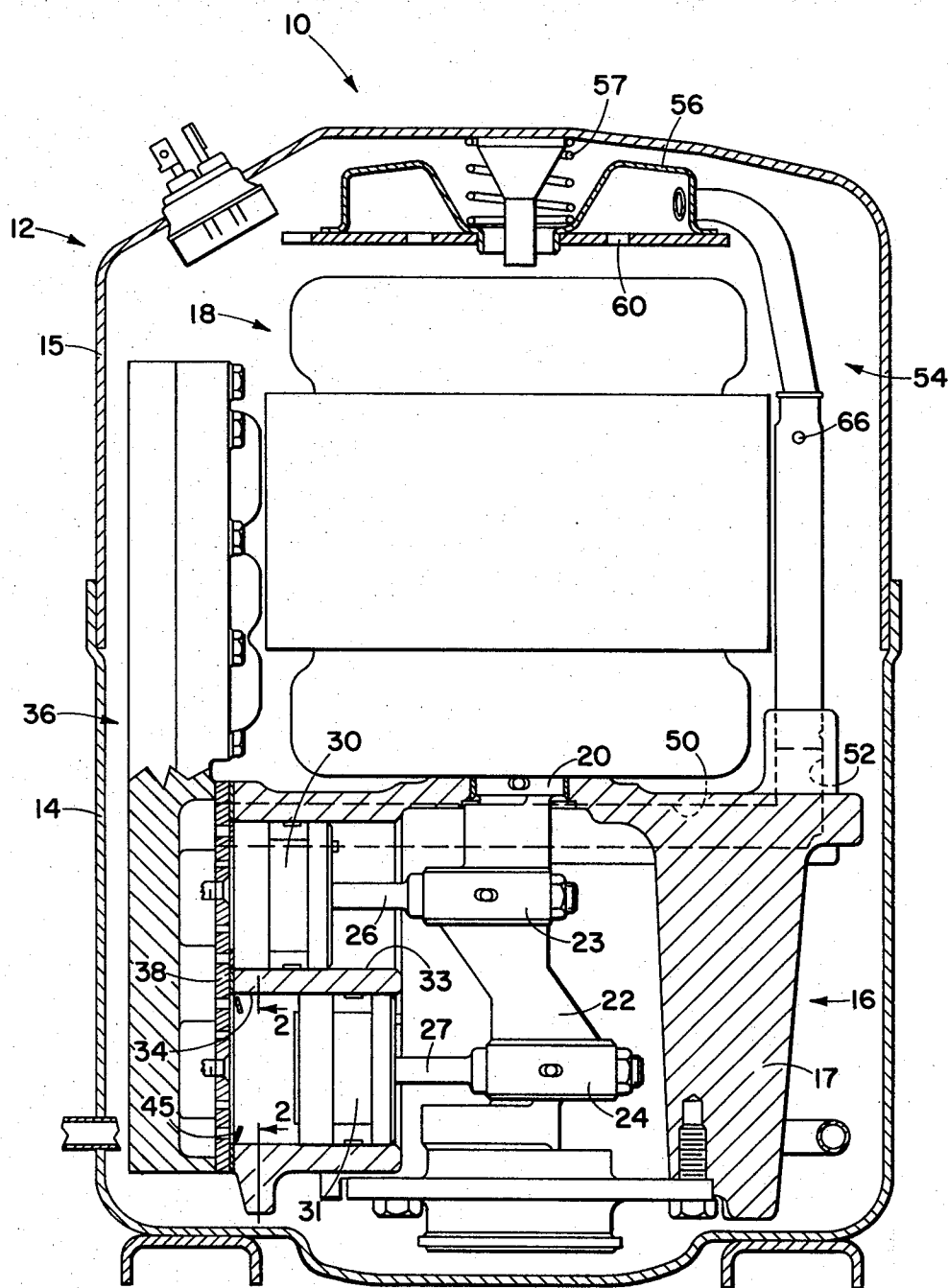


FIG. 1.

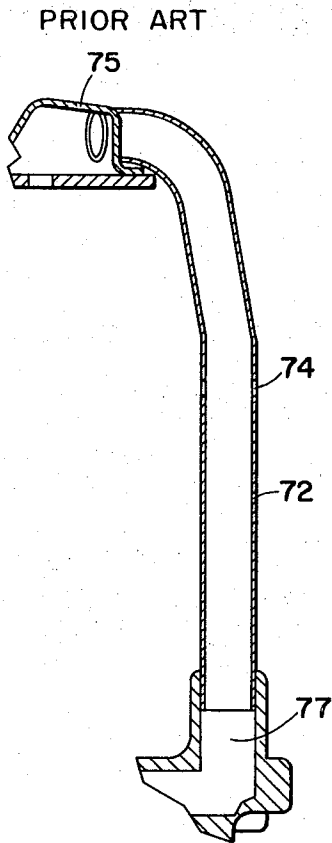


FIG. 5.

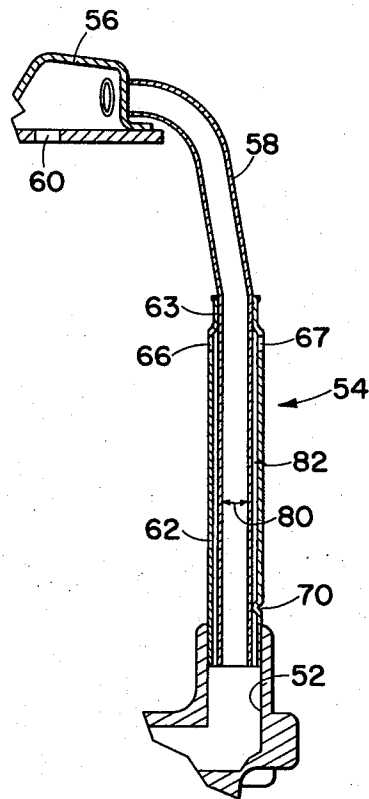


FIG. 4.

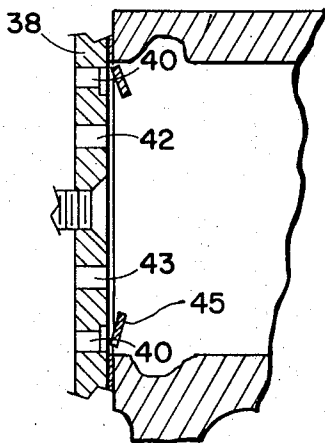


FIG. 3.

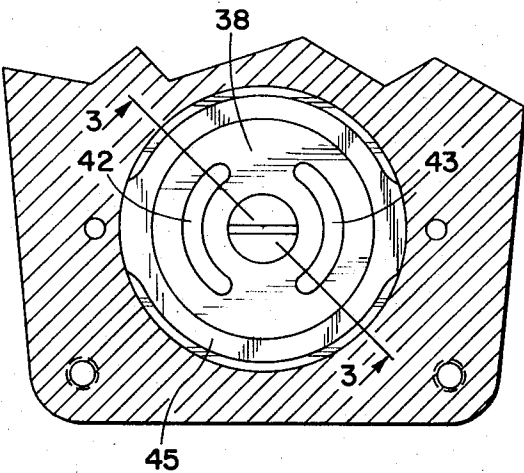


FIG. 2.

SUCTION MUFFLER TUBE FOR COMPRESSOR

CROSS REFERENCE TO RELATED APPLICATION

Other features of the compressor are disclosed and claimed in my copending application Ser. no. 385,882 filed Aug. 6, 1973.

BACKGROUND OF THE PRESENT INVENTION

In gas compressors it has been conventional to provide elongated suction inlet tubing and mufflers for the purpose of reducing intake noise produced by the compressor intake valving. To further attenuate high frequency noise it has also been suggested that by-pass apertures be provided at a point intermediate the length of the intake tube for permitting intake noise waves to pass into the housing out of phase with the intake noise from the muffler and effecting what is termed in the art as wave cancellation.

The problem with this prior construction is that it fails to attenuate the low frequency noise also emanating from the inlet valving. Low frequency noise is reduced by raising the inductive impedance. Inductive impedance is a direct function of the length of the suction inlet tube and an inverse function of the cross-sectional area of the inlet tube.

It is not practical to lengthen the inlet tube because of the limitation on the overall housing size, and it is also undesirable to reduce the cross-section of the suction inlet tube since this will cause intake starvation to the compressor.

It is the primary object of the present invention to minimize the intake noise problem in prior art devices described above.

SUMMARY OF THE PRESENT INVENTION

In accordance with the present invention a gas compressor is provided that attenuates both high and low frequency noise at the intake of the compressor without causing any intake starvation.

This is effected through the provision of an improved suction inlet tubing assembly. Firstly, there is provided an inner suction inlet tube extending from the compressor inlet to the muffler. This suction inlet tube has a cross-sectional area less than that required to feed the pump inlet and thus provides a greater inductive impedance that reduces noise in the compressor.

Surrounding the suction inlet tube is a by-pass tube extending partway up the suction inlet tube and closed around the inlet tube at the top thereof. Apertures are provided at the top of the by-pass tube to reduce noise and also provide secondary inlet flow to the compressor intake manifold. The cross-sectional area of the by-pass tube, i.e., the area of flow passage surrounding the suction inlet tube, is also less than prior art suction inlet tubes and thus provides a greater inductive impedance to low frequency noise generated by the intake valving.

However, the combined cross-sectional area of the suction inlet tube and the by-pass tube is the same as or greater than prior art constructions so that there is no starvation at the compressor inlet.

Other objects and advantages of the present invention will appear from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal fragmentary section of a compressor unit according to the present invention;

FIG. 2 is a fragmentary section illustrating the inlet valving for one of the compressor cylinder;

FIG. 3 is a cross-section taken generally along the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary section of the suction inlet tubing assembly, according to the present invention; and

FIG. 5 is a fragmentary section of a suction inlet tube according to the prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, particularly FIG. 1, a gas compressor unit 10 is illustrated consisting of a hermetic housing 12 having a cup-shaped lower housing member 14 interconnected with an upper housing member 15.

Within the housing 12 is a compressor unit 16 having a compressor block 17 supported in the lower housing 12 by suitable springs. Carried on the top of the compressor 16 is an electric motor 18 which drives the compressor through a centrally disposed shaft 20.

The shaft 20, supported in bearings in the frame or block 17 drives a crank shaft 22 having cranks 23 and 24 respectively driving connecting rods 26 and 27 in turn pivotally connected to pistons 30 and 31 reciprocable in cylinders 33 and 34, respectively. An intake and exhaust valving and manifold unit 36 is provided for conveying gases to and from the cylinders 33 and 34. The valving unit 36 includes a valving plate 38 shown more clearly in FIG. 2. The valve plate 38 includes a plurality of annularly arrayed inlet passages 40 along with two arcuate outlet ports 42 and 43.

The inlet ports 40 are selectively opened and closed by an annular reed valve 45 shown clearly in FIG. 1.

As seen in FIG. 1, upon the suction stroke of the piston 31 the reed valve 45 will bend downwardly exposing the ports 40 and permitting the intake of gas into cylinder 34. Suitable outlet valving is provided on top of the valving plate 38 for selectively opening and closing the ports 42 and 43 upon the upward movement of the piston 31.

A similar valving arrangement is provided in plate 38 for the cylinder 33.

For supplying gas to the inlet ports, an intake manifold passage 50 is provided having a vertically disposed intake inlet 52 which receives gases from a suction inlet tubing assembly 54. The suction inlet tubing 54 communicates with an annular muffler 56, for reducing inlet noise, which is suspended in the housing by spring 57. The muffler 56 has openings 60 in the lower plate thereof for the purpose of receiving inlet gas to the compressor.

As seen more clearly in FIG. 4, the suction tubing assembly 54 consists of a generally vertically extending inner suction inlet tube 58 extending from the compressor intake 52 to the muffler 56. Surrounding the inner suction inlet tube 58 is a concentric by-pass tube 62 which fits within the intake opening 52 and extends upwardly to a point 63 where it is fixed to the inner suction inlet tube 58. By-pass tube 62 has inlet apertures 66 and 67 (rotated 90° from the FIG. 1 view) for the purpose of receiving additional inlet fluid and also for permitting the attenuation of inlet valving noise by emitting noise waves within the housing 12 out of phase with noise from the muffler 56 to effect high frequency noise cancellation as discussed above.

The by-pass tube 62 has dimples 70 in the lower end thereof for maintaining concentricity between the inner intake tube 58 and the by-pass tube 62.

The purpose of the separate tube 62 is to provide attenuation for low frequency noise caused by the intake valving. As discussed above, the low frequency noise may be attenuated by increasing the inductive impedance of the intake tubing assembly. This can be done either by increasing the length of the intake tubing, or decreasing the cross-sectional area of the intake tubing. A prior art intake tube 72 is illustrated in FIG. 5 having conventional by-pass apertures 74 for receiving additional inflow by-passing muffler 75 while providing the desired high-frequency noise cancellation. If noise attenuation were attempted in this prior art construction, shown in FIG. 5, by decreasing the cross-section of suction inlet tube 72, gas starvation at the inlet 77 would occur. The present invention obviates this problem.

More specifically the cross section indicated by arrow 80 of the inner tube 58 is less than the prior art suction tube 72 so that the inductive impedance of the tube 58 is increased and low frequency noise attenuation is increased. By the same token, the cross-section indicated at 82 of the by-pass tube 62 is also less than the prior art intake tube 72 so that the inductive impedance of this tube is reduced and its noise attenuation increased. However, the combined flow areas defined by the cross-sectional areas 80 and 82 are the same as or greater than the prior art flow area defined by tube 72 so that the inlet 52 of the intake manifold is supplied with adequate inlet gas.

I claim:

1. A gas compressor, comprising:
a housing means,
a compressor in said housing means having intake valving,
an intake manifold leading to said intake valving,

intake muffler means opening into said housing means,

an intake muffler tube leading from said muffler means to said intake manifold, and

a by-pass tube leading to said intake manifold and opening into said housing means without passing into the muffler means, said by-pass tube being concentric with said intake tube and surrounding the same.

2. A gas compressor as defined in claim 1, wherein said by-pass tube has apertures therein for attenuating intake noise.

3. A gas compressor as defined in claim 2 wherein said intake tube and said by-pass tube each have a smaller cross-section than said intake manifold.

4. A gas compressor, comprising:

a housing,

an electric motor in said housing,

a reciprocating piston compressor in said housing, mounted below and driven by said electric motor, said compressor having inlet valving which generates noise,

an intake manifold connected to said inlet valving, muffler means mounted above the electric motor, a suction inlet tube extending from the muffler means alongside the electric motor to the intake manifold, and

means for reducing the effective cross-section of the suction inlet tube without restricting the inlet gas flow to the intake manifold including a noise reducing by-pass tube surrounding the inlet tube and opening into the intake manifold, said by-pass tube having a closed upper end engaging the suction inlet tube, said by-pass tube having aperture means therein permitting gas inflow and also attenuating noise.

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