Oct. 18, 1955 C. S. GRIMSHAW 2,721,029

SOUND DAMPING ARRANGEMENT

Filed April 19, 1954

FIG. 1

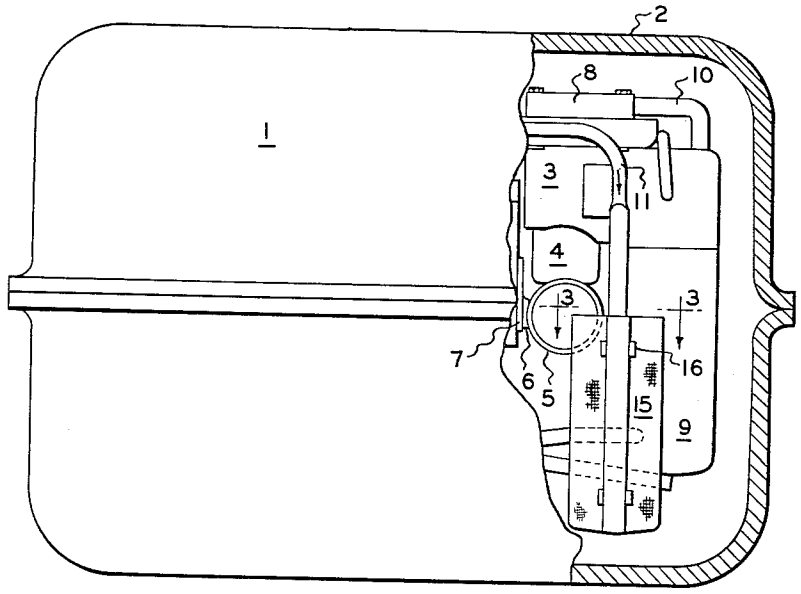


FIG. 2

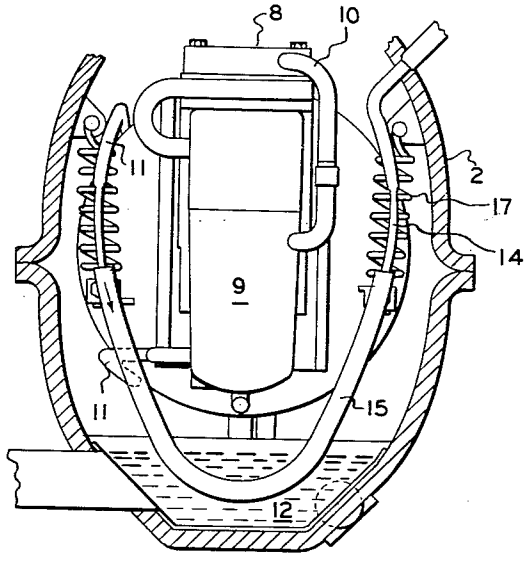
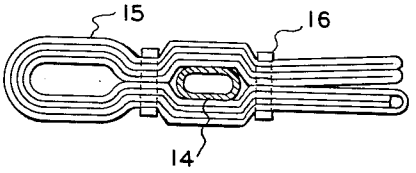


FIG. 3



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SOUND DAMPING ARRANGEMENT

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7 Claims. (Cl. 230—232)

This invention relates to hermetically sealed compressors and, more particularly, to a sound damping arrangement for high speed hermetically sealed internally spring mounted compressors.

Compressors are sometimes required to operate in locations where the noise level is low, and it is desirable to eliminate or minimize all noises produced by the normal operation of the compressor. The speed at which the compressor operates will determine the vibration and noise, to some extent, that is produced by the compressor. In hermetically sealed compressors, there is an exhaust tube for leading the compressed refrigerant from the internally spring mounted compressor to outside of the casing.

This exhaust tube will vibrate due to several factors. It is attached to a spring-mounted compressor, which is vibrating. The vibrant compressor will cause the tube to fatigue and break or transmit noise to the casing if a suitable sound and vibration damping arrangement is not provided. The exhaust tube will also conduct the audible noise of the compressor to the casing if sound damping is not employed. Since the exhaust tube is carrying a vapor at a high pressure with a high noise energy, the tube will also vibrate due to its reaction to vapor pulses at bends and where the tube changes dimensions.

The present invention reduces the noise and vibration produced by high speed hermetically sealed compressors by employing the lubricating oil as a viscous damper in cooperation with a porous member such as a wire screen.

The principal object of the present invention is to provide a device for reducing the noise of a high speed small horsepower hermetically sealed compressor.

An object of the invention is to reduce the noise and vibration transmitted from an internally mounted compressor to the case.

A further object of the invention is to provide a device for reducing the vibrations causing fatigue breakage in a hermetically sealed compressor.

Another object of this invention is to provide a device for damping the exhaust tube of a hermetically refrigerant compressor.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

This invention relates to a hermetic compressor comprising a sealed casing having a compressor cylinder disposed within the casing. The cylinder compresses vapor and means is provided for connecting the discharge side of the cylinder with an exhaust muffler to carry the compressed vapor from the cylinder to the exhaust muffler. An exhaust tube is disposed within the casing and conducts the compressed vapor from the exhaust muffler to the outside of the casing. The lower portion of the casing serves as a sump for the lubricating oil of the compressor and a portion of the exhaust tube passes through this lubricating oil. A porous member surrounds at least the portion of the exhaust tube disposed in the lubricating oil to dampen vibrations in the exhaust tube.

For a better understanding of the invention reference may be had to the accompanying drawing, in which:

Fig. 1 is a view partly in section of a hermetically sealed compressor embodying the present invention;

Fig. 2 is a sectional view of a portion of the compressor of Fig. 1 taken at right angles to Fig. 1; and

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1.

Referring to the drawing and particularly Fig. 1, there is shown a hermetically sealed compressor **1** including a casing **2**. Disposed within the casing **2** is a cylinder **3** in which vapor is compressed by movement of a piston **4**. This piston may be operated by any suitable well-known means but is preferably actuated by a sliding yoke **5** that is connected to the piston **4**. An eccentric **6**, which is mounted on a crankshaft **7** of a motor (not shown) operates in a slot (not shown) of the sliding yoke **5** to provide the reciprocating movement of the piston **4** within the cylinder **3** to compress the vapor.

The discharge head **8** of the cylinder **3** is connected to an exhaust muffler **9** by a suitable line **10** to permit passage of the compressed vapor from the cylinder **3** to the exhaust muffler **9**. The vapor is discharged from the discharge head **8** in pulses. The muffler reduces substantially these vapor pulses before they are transmitted to a second line **11**.

Line **11** preferably is flexible and serves as an exhaust tube to carry the compressed or exhaust vapor from the bottom portion of the exhaust muffler **9** to a point outside of the casing **2** such as the condenser of the well-known refrigerating system, for example. The exhaust tube is welded to the casing to provide a leak-tight joint. A portion **14** of this exhaust tube **11** passes below the exhaust muffler **9**. This portion **14** is near the center of the tube, and therefore has high relative motion with reference to both the exhaust muffler and the case. This portion of the exhaust tube passes through the lubricating oil **12** that is collected in the lower part of the casing **2**, which serves as a sump for this lubricating oil. The portion **14** of the exhaust tube **11** that passes beneath the exhaust muffler **9** is flattened to give an oval shaped cross-section rather than a circular cross-section. This oval section has lower rigidity than the round section to rotation about the axis of the compressor shaft, therefore most of the rotational flexing takes place in this section. This also permits the porous member **15** such as a wire screen, for example, to be more readily attached to the exhaust tube **11**. Staples **16** or other suitable fastening means are employed to hold the porous member **15** about the portion **14** of the exhaust tube **11**. The porous member **15** is preferably composed of several layers of wire screen, for example, but the number of layers may be varied as desired. The porous member **15** extends along the exhaust tube **11** for a distance above the level of the lubricating oil **12** in the lower part of the casing **2**. The exact distance that the porous member **15** extends above the level of the lubricating oil may be varied as desired. The porous member **15** is spring loaded on exhaust tube **11** so as to permit movement of the tube **11** with respect to the member **15**.

The entire compressor assembly is resiliently mounted within the casing **2** by a plurality of springs **17**. Preferably, four springs are employed though only two are shown in the drawing. While the assembly has been shown and described as resiliently mounted within the casing, it will be understood that the assembly could be fixedly mounted within the casing, if desired in which

case vibration of the exhaust tube **11** would result principally from vapor pulsations.

During the operation of the compressor, a body of lubricating oil is always present in the lower portion of the casing **2** so that the portion of the porous member **15** that is disposed in the lubricating oil has oil in all of its pores. Oil also collects in the pores above the oil level and is held therein by surface tension. This oil is supplied by droplets dispersed in the case by the crankshaft.

Noise that enters the oil surface is transmitted directly through the oil to the casing. Thus, the oil in the sump of the casing serves only to dampen vibrations due to movement of the exhaust tube. Therefore, the noise from the compressor, which is due mainly to the operation of the compressor valves, must be dampened before reaching the oil in the sump. This is accomplished by the section of the porous member that extends out of the oil. The small partially confined liquid volumes of oil in the pores of the porous member dissipate the sound energy resulting from the compressor. Low frequencies of noise resulting mainly from the crankshaft **7** being out of balance are eliminated by viscous damping of the oil while high frequencies resulting primarily from the opening of the compressor valves cause motion of the porous member due to the vibration of the exhaust tube **11** and are eliminated by frictional damping.

While lubricating oil has been referred to throughout the specification, it will be understood that other suitable viscous liquid could be employed if such were provided in the lower portion of the casing **2**. While the exhaust muffler **9** has been described as being disposed within the casing, it will be understood that the exhaust muffler could be disposed outside the casing, if desired, in which case the exhaust tube **11** would provide the connection between the compressor **3** and the muffler.

This invention has the advantage of employing a single small part that will reduce noises of both high and low amplitudes. This invention also has the advantage that there are no loose particles that may get into the bearings of the compressor. A further advantage is that the damping medium is disposed both above and below the oil reservoir. This damper arrangement is advantageous in that the wire screen may be easily evacuated.

While the present invention has been described by reference to a particular embodiment thereof, it will be understood that modifications may be made by those skilled in the art without actually departing from the invention. I, therefore, aim in the appended claims to cover all such variations as come within the true spirit and scope of the foregoing disclosure.

I claim:

1. A hermetic compressor comprising a sealed casing, a cylinder disposed within said casing for compressing a vapor, an exhaust muffler, a line connecting the discharge side of said cylinder with said exhaust muffler, a second line disposed within said casing, said second line connected at one end to said exhaust muffler, the other end of said second line extending outside the casing, the lower portion of said casing serving as a sump for a viscous liquid, a portion of said second line passing through said viscous liquid, and a porous member surrounding at least said portion of said second line disposed in said viscous liquid to dampen vibrations.

2. A hermetic compressor comprising a sealed casing, a cylinder disposed within said casing for compressing a vapor, an exhaust muffler, a line connecting the discharge side of said cylinder with said exhaust muffler, a second line disposed within said casing, said second line connected at one end to said exhaust muffler, the other end of said second line extending outside the casing, the lower portion of said casing serving as a sump for a viscous liquid, a portion of said second line passing through said viscous liquid, and a porous member surrounding at least said portion of said second line disposed in said viscous liquid and spaced from said second line to dampen vibrations.

3. A hermetic compressor comprising a sealed casing, a cylinder disposed within said casing for compressing a vapor, an exhaust muffler, a line connecting the discharge side of said cylinder with said exhaust muffler, a second line disposed within said casing, said second line connected at one end to said exhaust muffler, the other end of said second line extending outside the casing, the lower portion of said casing serving as a sump for a lubricating liquid, a portion of said second line passing through said lubricating liquid, and a wire screen member surrounding a portion of said second line including said portion of said second line disposed in said lubricating liquid.

4. A hermetic compressor comprising a sealed casing, a cylinder disposed within said casing for compressing a vapor, an exhaust muffler, a line connecting the discharge side of said cylinder with said exhaust muffler, a second line disposed within said casing, said second line connected at one end to said exhaust muffler, the other end of said second line extending outside the casing, the lower portion of said casing serving as a sump for a viscous liquid, a portion of said second line passing through said viscous liquid, and a wire screen surrounding at least said portion of said second line disposed in said viscous liquid to dampen vibrations.

5. A hermetic compressor comprising a sealed casing, a cylinder resiliently mounted within said casing for compressing a vapor, means connecting the discharge side of said cylinder to a point outside of said casing, the lower portion of said casing serving as a sump for a viscous liquid, and a porous member surrounding a part of said connecting means, said porous member being disposed partly above and partly below the level of said viscous liquid to dampen vibrations.

6. A hermetic compressor comprising a sealed casing, a cylinder resiliently mounted within said casing for compressing a vapor, means connecting the discharge side of said cylinder to a point outside of said casing, the lower portion of said casing serving as a sump for a viscous liquid, and a porous member surrounding the lowermost part of said connecting means, said porous member being disposed partly above and partly below the level of said viscous liquid to dampen vibrations.

7. A hermetic compressor comprising a sealed casing, a cylinder resiliently mounted within said casing for compressing a vapor, a line conducting said compressed vapor outside of said casing, the lower portion of said casing serving as a sump for a viscous liquid, and a porous member attached to a central portion of said line, a portion of said porous member being disposed in said viscous liquid to dampen large vibrations, the remaining portion of said porous member being disposed above said viscous liquid to permit the pores of the remaining portion to be filled with viscous liquid to dampen audible vibrations.

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