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COMPRESSOR DISCHARGE SILENCER

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Fig. 1

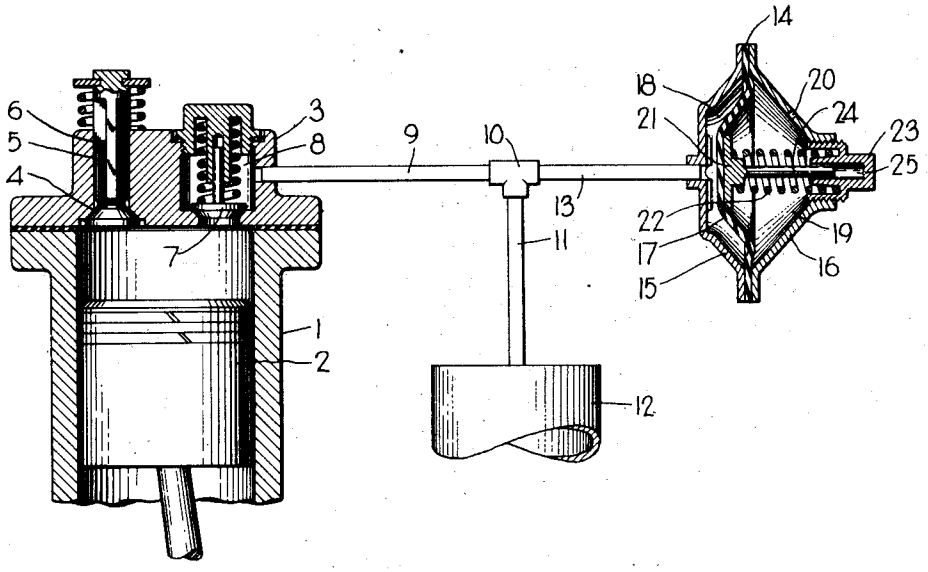
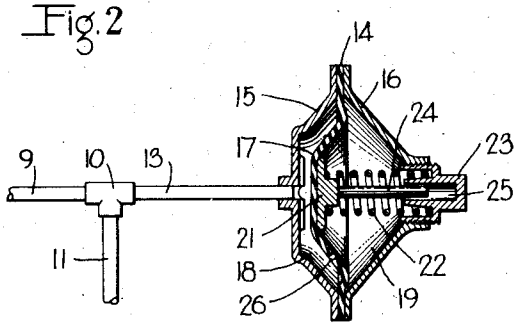


Fig. 2



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COMPRESSOR DISCHARGE SILENCER

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3 Claims. (Cl. 181—33)

This invention relates to sound dampeners and more particularly to a sound dampener for use in reciprocating machines, such as an air compressor or the like.

In the operation of reciprocating air compressors there occurs in certain installations a noise commonly referred to as "air ping." This noise is quite often produced in the compressor discharge pipe and in the reservoir to which said pipe is connected.

In the design of modern public conveyances, such as the new type high speed traction cars recently introduced in many large cities, the comfort of the passengers is considered of major importance. It will therefore be evident that any noise due to compressor operation, such as that above described, will be objectionable as disturbing to passengers.

The principal object of the present invention is to provide improved means for dampening or absorbing noises of this type produced by an air compressor.

This object is attained by the provision of a noise dampening or sound absorbing device connected to the compressor discharge conduit, preferably close to the compressor, which arrangement in practice has been found to substantially eliminate or dampen the noise above described. This noise dampening or sound absorbing device is preferably of the type having a movable abutment subject on one side to the pressure of the discharge line and on the opposite side to the pressure of an adjustable spring. The abutment provided therein is adapted to vibrate in accordance with the intermittent discharges of fluid from the compressor and presents, therefore, in effect a resilient wall which yields to the pressure surges from the compressor and thereby dampens or absorbs sound waves created at the compressor due to intermittent discharges of compressed air, or to the striking of the compressor discharge valve upon its seat.

Other objects and advantages of the invention will appear in the following more detailed description thereof.

In the accompanying drawing, Fig. 1 is a diagrammatic sectional view of a portion of a fluid compressor system embodying the invention; and Fig. 2 is a sectional view of a modified form of dampening device.

As shown in Fig. 1 of the drawing the invention is associated, for the purpose of illustration, with an air compressor. The compressor shown may be of the usual type and may comprise a casing having a cylinder section 1, in which a compressor piston 2 is operatively mounted.

Secured to the cylinder section 1 is a cylinder head 3, in which the usual inlet and outlet valves 4 and 7 are operatively mounted to control the necessary inlet and outlet connections.

The inlet valve 4 is provided with a fluted stem 5 slidably mounted in a bore 6 in the head 3 and the outlet valve 7 is contained in a chamber 8 in the head, which is connected by a discharge pipe 9, a pipe T 10, and a branch pipe 11 to a storage reservoir 12.

Located preferably close to the compressor, and connected to the discharge pipe 9 by means of the pipe T 10 and a pipe 13, is a noise dampening or sound absorbing device 14.

This noise dampening or sound absorbing device 14 comprises two casing sections 15 and 16 and a flexible diaphragm 17 clamped at its periphery between the two casing sections. On one side of the diaphragm 17 is a chamber 18 connected to the compressor discharge pipe 13 and on the opposite side a chamber 19 open to the atmosphere through a port 20 in the casing section 16.

A follower 21 is disposed in chamber 19 engaging the diaphragm 17 and a coil spring 22 is interposed between said follower 21 and adjusting nut 23. The adjusting nut 23 has screw threaded engagement with the casing whereby the pressure of spring 22 on the diaphragm may be varied to suit the pressure of fluid supplied by the compressor to chamber 18, as this pressure may be of different degrees in different installations or under different conditions. The follower is provided with a guide stem 24 slidably mounted in a suitable bore 25 provided in the nut 23.

In operation, the reciprocating compressor acts in the usual well known manner to effect intermittent discharges of compressed air into pipe 9, whence it flows through pipe T 10, pipe 11 into the reservoir 12.

Since the diaphragm chamber 18 of the noise dampener or sound absorbing device is open through pipe 13, pipe T 10 to pipe 9, and is located close to the compressor, the diaphragm will be flexed in the direction of and against the spring upon the crest of a pressure wave in said pipe, while upon the fall of pressure in said pipe and chamber the diaphragm will be flexed in the opposite direction by the spring. The diaphragm will thus be caused to vibrate according to pressure changes in the pipe. The diaphragm acts as a resilient wall for the impingement of sound waves, and due to this vibration the chamber vol-

ume is varied, which variation in volume acts as a cushion to absorb or dampen sound waves.

It has been found in practice that this structure effectively reduces the noise in the discharge pipe and reservoir. It has also been found in practice that this structure effectively reduces the hammer sound in compressor installations and is most effective when the discharge pipe is as short as possible and when the dampener is connected to the end of said pipe opposite the end connected to the compressor, in which case the pipe leading to the reservoir is in the form of a branch pipe, as shown in Fig. 1 of the drawing. This construction is believed to be most effective due to the fact that sound and pressure waves tend to travel in a straight line, so that such waves created in the discharge pipe 9 travel directly into the dampener and are there dampened, or their amplitude so reduced, due to the action of the diaphragm, as to eliminate or reduce to a negligible degree the noise in the compressor installation.

Fig. 2 shows a modified form of noise dampening or sound absorbing device in which chamber 19 is isolated from the atmosphere by elimination of port 20 through the casing section 16, and the chamber 18 and 19 at either side of the diaphragm 17 are communicatively connected by means of a port 26 through the diaphragm 17.

This noise dampening or sound absorbing device of Fig. 2 operates in a manner similar to the noise dampener or sound absorbing device shown in Fig. 1 and above described, except that the port 26 through the diaphragm 17 connecting chambers 18 and 19 is of such capacity that the pressure flow through said port to chamber 19 from chamber 18, upon an increase of pressure in the discharge pipes 9 and 11 from the compressor 1 to chamber 18, is sufficient to cause diaphragm 17 to flex in the direction of and against the opposing pressure of the spring 22 and of the pressure in chamber 19. Upon a decrease of the pressure in chamber 18 the port 26 restricts the return flow of pressure from chamber 19 to chamber 18, so that the spring 22 will return the diaphragm 17 to the position shown in the accompanying drawing.

From the foregoing it may be seen that the noise dampening device of Fig. 2 functions substantially the same as the noise dampening device of Fig. 1 before described. However, the device of Fig. 2 does not require adjustment of nut 23 to control the diaphragm movement, regardless of variations in the setting of reservoir pressure carried in different compressor installations.

While two illustrative embodiments of the invention have been described in detail, it is not my intention to limit its scope to these embodiments or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A device for dampening sound vibrations created in a conduit in which the pressure of fluid intermittently varies, comprising in combination, a casing, a movable abutment in said casing having at one side a chamber in communication with said conduit and having at the opposite side a chamber in communication with the atmosphere, means in the last named chamber for opposing movement of said abutment and means for varying the opposing force of the first mentioned means.

2. A device for dampening sound vibrations created in a conduit in which the pressure of fluid intermittently varies, comprising in combination, a casing, a movable abutment in said casing having at either side a chamber one of which is in communication with said conduit, and means establishing communication providing for restricted flow of fluid between said chambers.

3. A device for dampening sound vibrations created in a conduit in which the pressure of fluid intermittently varies, comprising in combination, a casing, a movable abutment in said casing having at one side a chamber in open communication with said conduit and having at the opposite side a chamber in restricted communication with said conduit, and additional means in the last named chamber for opposing movement of said abutment.

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