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MUFFLER FOR AIR CYLINDERS AND THE LIKE

Filed March 11, 1959

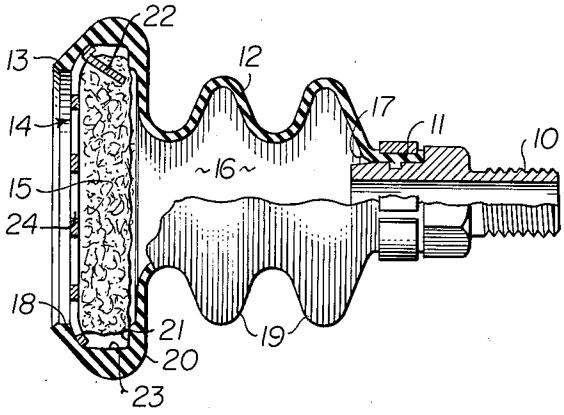


FIG. 1

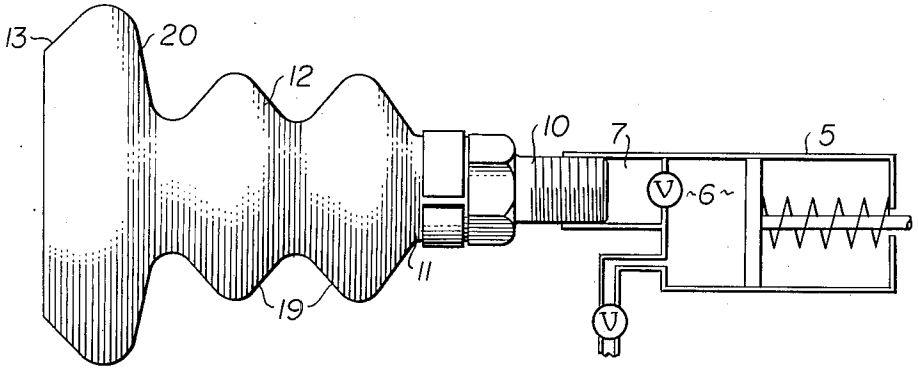


FIG. 2

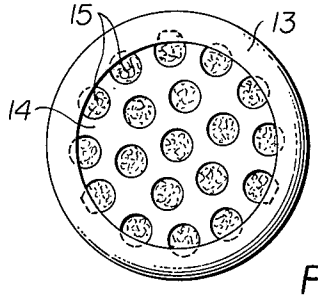


FIG. 3

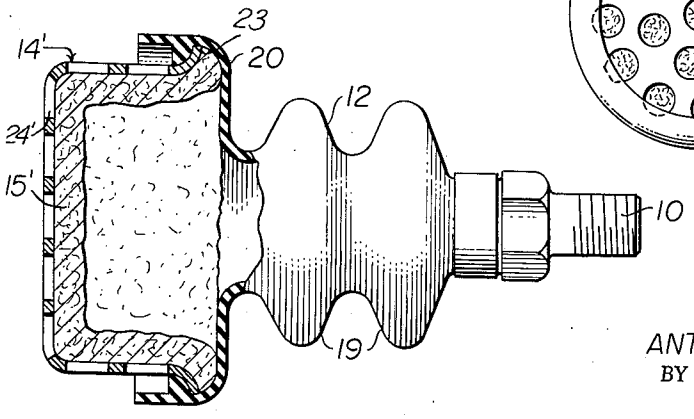


FIG. 4

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MUFFLER FOR AIR CYLINDERS AND THE LIKE

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This device relates to sound mufflers and more particularly to devices to deaden the noise incidental to air escaping from air actuated machines.

Therefore, one of the principal objects of this invention is to eliminate or substantially reduce the noise emitted by the passage of a compressible fluid from a higher to a lower pressure system.

A related object of this invention is to provide a new and novel fluid expansion chamber to cushion the reduction in pressure of a compressible fluid when it is released from a pressure system.

Another object of this invention is to provide a novel, expansible chamber to reduce the pressure of compressible fluid entering from the high pressure system and muffle the noise by means of a foraminous sound muffling material placed across the chamber. The fluid is expanded in the chamber and passed through the foraminous sound muffling material and then discharged into the ambient atmosphere.

Another related object of this invention is to provide a new and novel, simple, relatively inexpensive device to accomplish the above objects.

Another related object is to provide a simplified interchangeable device that requires no special tools to install or remove to accomplish the above objects.

Another related object is to provide a pad of foraminous sound muffling material mounted on resilient means to absorb the shock and deaden the sound of escaping gas.

Another object of this invention is to provide a sound muffling device that is self adjusting to pressures over a wide pressure range.

Another object of this invention is to provide a bellows shaped sound muffler that will effectively reduce the pressure of an escaping gas and a sound absorbing foraminous material in conjunction with this bellows to effectively eliminate or reduce to a minimum any noise emitted by gas escaping from a higher pressure system to the ambient atmosphere.

Another object of this invention is to provide an elastic side walled tubular bellows that will expand both longitudinally and circumferentially under the pressure of gas discharged into the bellows from a higher pressure system.

Another object of this invention is to provide an air actuated mechanism having an extended air outlet passage, which passage will effectively deaden or muffle the sound of the gas before it is discharged into the ambient atmosphere.

Another object of this invention is to provide a pad of foraminous sound muffling material on resilient means to absorb the shock of, and muffle the sound of air being discharged from an air actuated machine.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a view of the device with parts broken away to show a partial cross section;

FIGURE 2 is a schematic view of an air actuated mechanism and a view of one of the novel and improved mufflers attached to the air mechanism with the muffler being shown in an elongated condition assumed when air is released from the air actuated mechanism;

FIGURE 3 is an end view of the muffler device of FIGURES 1 and 2; and,

FIGURE 4 is a plan view of an alternate embodiment of the device with parts broken away and removed for clarity of illustration.

Referring to the drawings, and to FIGURE 2 in particular, an air actuated mechanism is shown schematically at 5. The mechanism has a pressure chamber 6 and an outlet passage 7. The outlet passage is to provide communication between the chamber 6 and ambient atmosphere.

A bellows 12 is provided. The bellows is an elastic resilient tube which has a through fluid passage 16. The passage 16 forms an extension of the outlet passage 7, and therefore can be considered to be a portion of the outlet passage 7. The bellows forms an imperforate passage side wall, which wall includes a plurality of circumferential plaits 19, 20. In the preferred and disclosed embodiment the end plait designated by the numeral 20 is of larger diameter than the remainder of the plaits. The reasons for the diameter difference will be explained in greater detail.

The bellows 12 has a first end portion 11. The first end portion 11 defines an inlet opening 17 to the passage 16. A fitting 10 is carried by the first end portion 11 and partially disposed within the inlet opening 17. The fitting 10 extends into the outlet passage 7 of the air cylinder to interconnect the passages 7, 16 into a single outlet passage.

The bellows 12 has a second end portion 13 which is a part of the end plait 20. The second end portion 13 defines an outlet opening 18 from the passage 16.

An internal annular recess 23 is defined by the end plait 20. The internal annular recess 23 has a shoulder 21 on the opposite side of the recess 23 from the second end portion 13. A pad 15 of a foraminous material, such as felt, is carried by the bellows 12 and positioned across the internal fluid passage 16 near the outlet opening 18. The periphery of the pad 15 is disposed within the recess 23. In the preferred and disclosed arrangement an annular peripheral portion of the pad 15 is urged against the shoulder 21 by the second end portion 13. The inherent resiliency of the end plait 20 presses the pad between the second end portion 13 and the shoulder 21.

The end plait 20 is of a large diameter to facilitate the provision of a large noise inhibiting pad 15. In such large diameter embodiments and particularly in high pressure applications, it is desirable to provide a retainer 14 to reinforce the pad and aid in axial location. The end plait 20 is distended over the metal retainer 14 to urge the retainer against the pad 15 and to urge the pad 15 in turn against the shoulder 21. The retainer 14 has a plurality of perforations 24 and a plurality of locating clips 22. The clips 22 aid in axially locating the pad 15. In low pressure small diameter applications the retainer 14 may be eliminated and axial location of the pad 15 is obtained by increasing the diameter so that the pad extends further into the recess 23.

The bellows 12 serves as a resilient means to urge the pad 15 toward the pressure chamber 6. In addition to its function as providing an extension of the outlet passage 7, the bellows also serves as a mounting to position the pad across the outlet passage. When air is released from the pressure chamber 6 it enters the outlet passage 7 and thence enters the passage 16. The passage 16 serves as an expansible portion of the outlet passage and thus as an expansible outlet passage. As air under pressure surges into the passage 16, the bellows will distend both radially and axially to form an expansion chamber for the escaping air and to cushion the shock of the impact of air pressure against the pad 15. The inherent re-

siliency of the bellows tends to urge the pad towards a relaxed condition to contract the expansible chamber.

After the pressure has escaped from the air cylinder, the bellows will gradually return to its relaxed condition as shown in FIGURE 1. During this return, air will continue to escape through the foraminous pad 15. Thus, with a fast acting cylinder, the sound muffler provides almost continuous air escape even though the escape from the chamber 6 is pulsating. This, coupled with the coaction of the sound muffling pad 15, serves to greatly inhibit the noise of the escaping air without causing an undue amount of back pressure.

In the embodiment of FIGURE 4 the bellows 12 is identical to the bellows of FIGURE 1. The retainer 14' of FIGURE 4 is somewhat cup-shaped. The pad 15' is of a corresponding cup-shape covering the perforations 24'. This construction provides a large air escape area with a bellows of minimal diameter.

While the invention has been described with a great deal of detail, it is believed that it essentially comprises an air actuated mechanism wherein a foraminous pad is disposed across the outlet passage and wherein resilient means urges the pad toward a pressure chamber to provide yieldable support for the pad.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made by way of example only and that numerous changes in the description and details of construction may be made without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A sound muffling device comprising, a tubular elastic bellows, said bellows having an imperforate side wall defining a through fluid passage, said bellows having first and second spaced ends, said side wall having a first end portion defining a fluid inlet opening at the first end, said side wall having a second end portion defining a fluid outlet opening at said second end, said wall having a transversely disposed shoulder near said second end, a pad of foraminous sound muffling material carried by said bellows adjacent said shoulder, said pad being disposed across said passage, and stiffening means maintaining the bellows in an expanded condition around the pad and preventing the lateral crushing of the pad.

2. A sound muffling device comprising, a tubular elastic bellows, said bellows having an imperforate side wall defining a through fluid passage, said bellows having first and second spaced ends, said side wall having a first end portion defining a fluid inlet opening at the first end, said side wall having a second end portion defining a fluid outlet opening at the second end, said bellows having at least one circumferential plait near said second end, the one plait having an inner surface defining an annular recess and a shoulder, a foraminous pad carried by said bellows, said pad being disposed in part within the recess and against said shoulder, and means to maintain said pad disposed across said passage.

3. A sound muffling device comprising, a tubular elastic bellows having an imperforate side wall defining an internal through fluid passage, said bellows having first and second spaced ends, said wall having a first end portion defining a fluid inlet opening at the first end, said side wall having a second end portion defining a fluid outlet opening at the second end, said bellows having a plurality of circumferential plaits, one of said plaits being near said second end, said one plait defining an annular recess having an inner shoulder, a foraminous pad carried by said bellows and disposed in part within the annular recess, said pad abutting said shoulder, said pad being positioned by compression of the peripheral portion of said one plait, and said pad being disposed across said passage.

4. In the device of claim 2, said means being a retainer carried by said bellows and at least partially disposed against said pad, said bellows being distended radially over said retainer, and said pad being positioned between said retainer and said first end of said bellows.

5. In the device of claim 3, a perforate retainer carried by the bellows and disposed in part within the annular recess, said one plait being distended radially over said retainer, and said pad being positioned between said retainer and said first end of said belows.

6. The device of claim 2 wherein the means is a retainer in the form of a perforated cup.

7. A sound muffling device comprising a tubular bellows, said bellows having an imperforate elastic side wall, said side wall having a plurality of circumferential plaits, said side wall defining an internal fluid expansion chamber, said chamber being a through fluid passage, said bellows having first and second spaced ends, said wall having a first end portion defining a fluid inlet opening into said chamber at said first end, a fitting fixed to said first wall portion, said fitting being at least partially disposed in said inlet opening, said wall having a second end portion defining a fluid outlet opening from said chamber at said second end, one of the plaits being nearest said second end portion of said wall, said one plait having substantially greater circumference than any other plait, said one plait defining an internal annular recess having an inner shoulder, a perforated metal retainer having a plurality of radial locating clips, said metal retainer positioned in said annular recess and said one plait being distended radially over said retainer, said retainer being held in said annular recess by radial pressure exerted by said distended plait, a felt pad extending into said annular recess between said metal retainer and said first end of said bellows, said felt pad being radially located by said locating clips, said felt pad being held in position by compression of a peripheral portion thereof between the retainer and said shoulder.

8. In combination, an air actuated mechanism having an exhaust outlet, a foraminous pad across the outlet, and yieldable means supporting the pad and securing the pad to the mechanism, said means maintaining the pad across the outlet such that all air emitted by the outlet is directed through the pad, said yieldable means biasing the pad towards the outlet when air is emitted by the outlet.

9. An air muffler comprising, a tubular elastic bellows having expansible imperforate side walls extending from an inlet to an outlet, a foraminous muffler pad across the outlet and secured to the bellows in tight relationship such that all air passing through the outlet passes through the pad, stiffening means within said bellows maintaining the bellows in an expanded condition around the pad and preventing lateral crushing of the pad, and other means connected to the bellows to secure said inlet to an air cylinder outlet in fluid tight relationship whereby all air emitted by the cylinder is confined to the expansible bellows and passes through the tube and the pad.

10. The device of claim 9 wherein said stiffening means is a perforated retainer abutting the pad and disposed with the pad in an annular recess in the bellows and adjacent the outlet.

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