Jan. 25, 1938. H. L. HARGNETT 2,106,482

MUFFLER

Filed Aug. 27, 1936

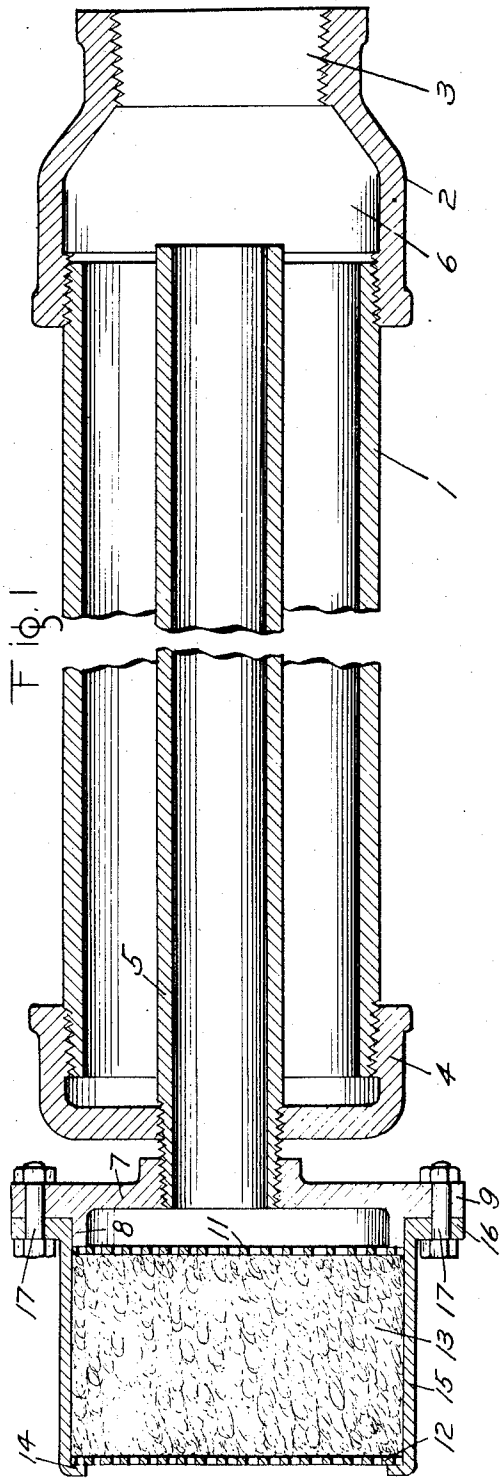

Fig. 1

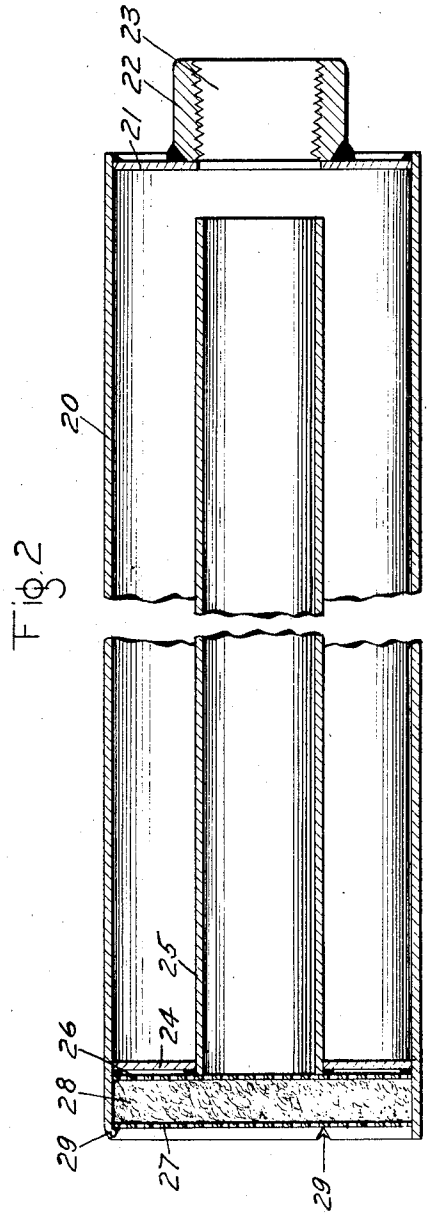

Fig. 2

INVENTOR
HAROLD L. HARGNETT
BY Wm. A. Cady
ATTORNEY

Patented Jan. 25, 1938 2,106,482

UNITED STATES PATENT OFFICE

2,106,482

MUFFLER

Harold L. Hargnett, Turtle Creek, Pa., assignor to The Westinghouse Air Brake Company, Wilmerding, Pa., a corporation of Pennsylvania

Application August 27, 1936, Serial No. 98,131

8 Claims. (Cl. 181—35)

This invention relates to a muffler or silencer adapted for use in the intake passage of fluid compressors.

In some compressors, such as those of the reciprocating piston type, considerable noise is developed at the air intake due to changes in the rate and direction of air flow.

The principal object of my invention is the provision of an improved muffler or silencer adapted to be employed in the intake passage of a fluid compressor for eliminating noise.

Other objects and advantages of my invention will be apparent from the following description of certain preferred embodiments thereof, reference being had to the accompanying drawing, in which

Fig. 1 is a longitudinal sectional view of a combined strainer and muffler illustrated in one preferred embodiment of my invention, and

Fig. 2 is a longitudinal sectional view illustrating a second preferred embodiment of my invention.

Referring to the drawing and particularly to Fig. 1 thereof, a tubular casing 1 is provided, one end of which is screw-threadedly attached to a coupling member 2 having an opening 3 adapted to be connected to the intake pipe of a fluid compressor. A cap or closing member 4 is screw-threadedly attached to the outer end of the tubular member 1 and is provided with a central bore that is tapped to receive the screw-threaded end of an inner tubular member 5 that extends therethrough, the inner end of which extends substantially the full length of the outer tubular member 1 and terminates in an open end adjacent the coupling opening 3, thus providing a chamber 6 adjacent the opening 3 and surrounding the casing member 5 within the casing member 1. The outer open end of the tubular member 5 is screw-threaded to receive and support a disc plate 7 having a cylindrical annular flange 8 and an outwardly extending flange 9 comprising a support for a strainer mechanism consisting of perforated metal plates 11 and 12 spaced apart and containing fibrous material, such as curled hair 13, therebetween. The plate 11 is adapted to engage the outer edge of the flange 8 and the plate 11 is held by an inwardly extending annular flange 14 of a casing 15 enclosing the curled hair 13 and the metal plates 11 and 12, and provided at its inner end with an outwardly extending flange 16 adapted to mate with the flange 9 and be secured thereto by a suitable securing means, such as bolts 17.

During operation of the compressor air is taken into the compressor through the opening 3 from the chamber 6. The supply of air from the chamber 6 to the compressor through the compressor inlet passage is not a steady flow but is intermittent, depending upon the piston and valve action of the compressor which is determined by the compressor speed. Air is taken from the chamber 6 during each intake stroke of the compressor, but not during the intervals between the successive intake strokes of the compressor. Upon a compressor intake stroke, a differential in pressures is therefore created between the chamber 6 and the atmosphere caused by the removal of air from the chamber 6, which causes the flow of air from the atmosphere through the curled hair strainer and the tubular member 5 into the chamber 6. A slight time interval is required to replace the air in the chamber 6 taken during each intake stroke of the compressor, and to thus substantially eliminate the differential pressures between the chamber 6 and the atmosphere, this time interval being determined by the volume of the chamber 6, and by the size of the tubular member 5 and the tightness of the strainer 13, which are so designed as to effect a substantially constant flow of air from the atmosphere to the chamber 6. That is, the time interval required to reestablish the pressure in the chamber 6 in correspondence with atmospheric pressure is designed to be substantially the time interval between successive intake strokes of the compressor, thus insuring a nearly steady flow of air from the atmosphere to the chamber 6, the absence of pulsations at the strainer or atmospheric end of the intake to the compressor resulting in a quiet and steady flow of air to the compressor.

The construction shown in Fig. 2 operates on the same principle as that shown in Fig. 1, but is somewhat different in detailed construction. In Fig. 2 an outer tubular casing 20 is provided having an annular end wall 21 welded thereto, and to which is welded a tubular coupling member 22 that may be screw-threadedly attached to effect communication through the opening 23 with the intake pipe of a compressor. Near the outer end of the tubular member 20 an annular end plate 24 is welded to which is welded an inner tubular member 25 that extends through the annular member 24 and the inner end of which terminates adjacent the inner end of the outer tubular member 20. Within the outer end of the tubular member 20 a strainer mechanism is provided between the partition 24 and the outer end thereof, and which consists of spaced perforated metal

plates 26 and 27 between which is packed any suitable straining and silencing material, such as curled hair 28. The plate 26 is adapted to engage the end of the tubular member 25 and the plate 27 is held in position by crimped portions 29 in the end of the outer tubular member 20.

The construction illustrated in Fig. 2 operates on the same principle as that illustrated in Fig. 1, to provide a time element for the incoming air to pass through the strainer 28 and the inner tubular member 25 to thus eliminate or largely reduce, the pulsations of air from the atmosphere occasioned by the intermittent flow of air into the compressor structure proper during successive intake strokes thereof. It will be appreciated that in both forms of construction the design of the strainer mechanism and the inner tubular member is such as to effect a substantially continuous flow of air from the atmosphere toward the chamber at the intake end of the muffler, the pressure differential between the chamber and the atmosphere being substantially reduced between intake strokes of the compressor.

It will be apparent to those skilled in the art that modifications in the apparatus illustrated and described may be made within the spirit of my invention, and I do not wish to be limited otherwise than by the scope of the appended claims.

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

1. In a silencer for compressors, in combination, an outer casing having an open end adapted to be connected to the intake of a fluid compressor, and a closed end, an inner casing of lesser dimension than the first named casing extending through the closed end of the first named casing and through substantially the full length of said first named casing member and terminating at a point adjacent to but spaced from said open end of said outer casing to form a space between the inner open end thereof and the compressor intake end of the outer casing, said inner casing having its outer end in communication with the atmosphere.

2. In a silencer for compressors, in combination, a tubular casing member having an open end adapted to be connected to the intake of a fluid compressor, a closure member for closing the outer end thereof, a tubular casing of lesser diameter than the first named casing member and extending through said closure member and extending for substantially the full length of the first named casing member and terminating to provide a space between the inner open end thereof and the compressor intake end of the outer casing forming an intake chamber, said inner tubular member having its end in communication with the atmosphere and being of such a size with respect to said intake chamber volume as to effect a substantial time element in the equalization of pressures between atmospheric pressure and intake chamber pressure between inlet strokes of the compressor.

3. In a silencer for compressors, in combination, an outer casing member having an open end adapted to be connected to the intake of a fluid compressor, and a closed end, an inner casing member of smaller cross sectional diameter than the outer casing member and extending through the closed end thereof a substantial distance into the outer casing member and terminating to form a chamber within the outer casing member, the end of said inner casing member within said chamber being positioned adjacent to but spaced from the open end of said outer casing, a strainer comprising a body of closely packed fibrous material mounted in the path of air flow from the atmosphere through the smaller casing member, the parts communicating between the atmosphere and the chamber within the outer casing member being so designed as to effect a substantial time element in the equalization of pressures therebetween following the supply of fluid from said chamber to a compressor during an intake compressor stroke.

4. In a device of the class described, in combination, a tubular body having a discharge opening in one end wall thereof and having a supply opening in the other end wall thereof, the discharge opening being adapted to be connected to the inlet passage of a fluid compressor, and a tubular member mounted within said body and secured to the end wall thereof surrounding said supply opening, one end of the passage in said tubular member communicating with the chamber within said body at a point adjacent to but spaced from the point at which the discharge opening communicates with said chamber, the other end of the passage in said tubular member communicating with the atmosphere.

5. In an intake silencer for a compressor of the type having alternate intake and compression strokes, in combination, a tubular body having a discharge opening in one end wall thereof and a supply opening in the other end wall thereof, the discharge opening being adapted to be connected to the inlet passage of the compressor, and a tubular member mounted within said body and secured to the end wall surrounding said supply opening, one end of the passage in said tubular member communicating with the chamber in said tubular body at a point adjacent to but spaced from the point at which the discharge opening communicates with said chamber, the other end of the passage in said tubular member communicating with the atmosphere, the rate of flow of fluid through the passage in the tubular member being less rapid than the rate of flow of fluid to the compressor during the intake strokes of the compressor, whereby fluid is supplied to the compressor from the chamber in the tubular body during the intake strokes of the compressor, the rate of flow of fluid through the tubular member being rapid enough to restore the pressure of the fluid in said chamber during the compression strokes of the compressor.

6. In an intake silencer for a compressor of the type having alternate intake and compression strokes, in combination, a body having a chamber therein and having a discharge opening in a wall thereof, said discharge opening being adapted to be connected to the inlet passage of the compressor, and a member having a passage therethrough having one end open to the atmosphere and having the other end open to the chamber in said body, said other end of said passage confronting said discharge opening and being disposed adjacent to but spaced therefrom, whereby on a reduction in the pressure of the fluid in the inlet passage of the compressor fluid is supplied thereto during the inlet stroke of the compressor from the atmosphere through the passage in said member and is also supplied to the compressor from the chamber in said body, and whereby during the compression stroke of the compressor fluid is supplied from the atmos-

phere to the chamber in said body through the passage in said member.

7. In an intake silencer for an air compressor, in combination, a tubular body having a closed end and having an opening in the other end adapted to be connected to the inlet passage of a compressor, a tubular member of substantially smaller diameter than said tubular body extending through an aperture in the closed end of said body and extending within said tubular body to a point adjacent the open end thereof, said tubular member having one end open to the atmosphere and having the other end open to the chamber within said tubular body, the opening through said tubular member and the volume of the chamber within the tubular body being proportioned so that a substantial time is required for the pressure of the fluid in said chamber to equalize with the atmosphere by flow of fluid to said chamber through said tubular member.

8. In a device of the class described, in combination, a tubular body having a closed end and having a centrally located discharge opening in the other end adapted to be connected in the inlet passage of a fluid compressor, and a tubular member of substantially smaller diameter than said tubular body extending through an aperture in the closed end of the tubular body, said member being disposed substantially concentric of said body and extending within said body to a point adjacent said discharge opening, one end of the passage through said tubular member being open to the chamber within said body and the other end of the passage through said member being open to the atmosphere, the flow capacity of the passage through said tubular member and the volume of the chamber in said tubular body being proportioned so that a substantial time is required for the pressure of the fluid in the chamber in said tubular body to equalize with the pressure of the atmosphere by flow through the passage in said tubular member.

HAROLD L. HARGNETT.