

[54] **NOISE SUPPRESSED VENTURI POWER UNIT**

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[58] Field of Search 417/151, 312;
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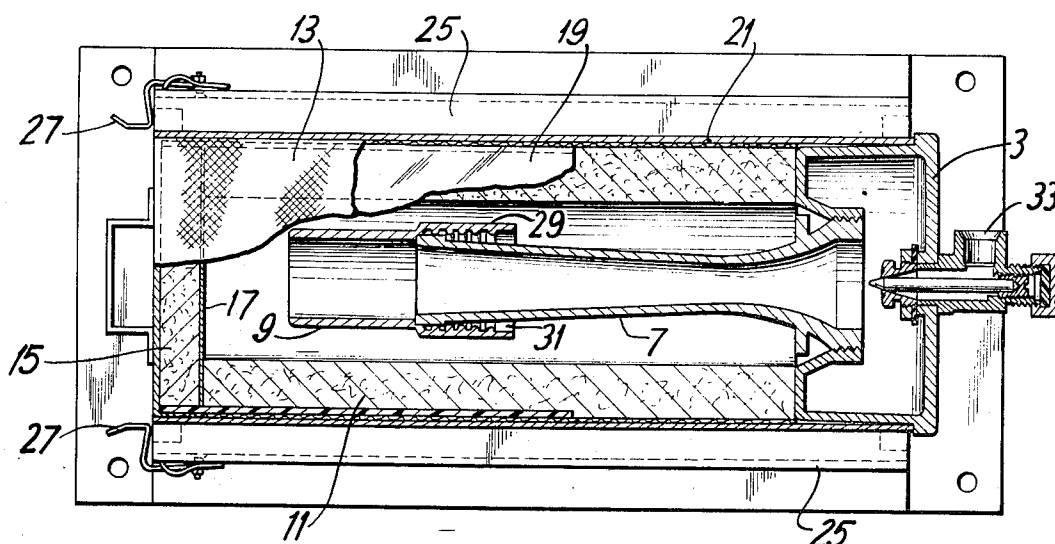
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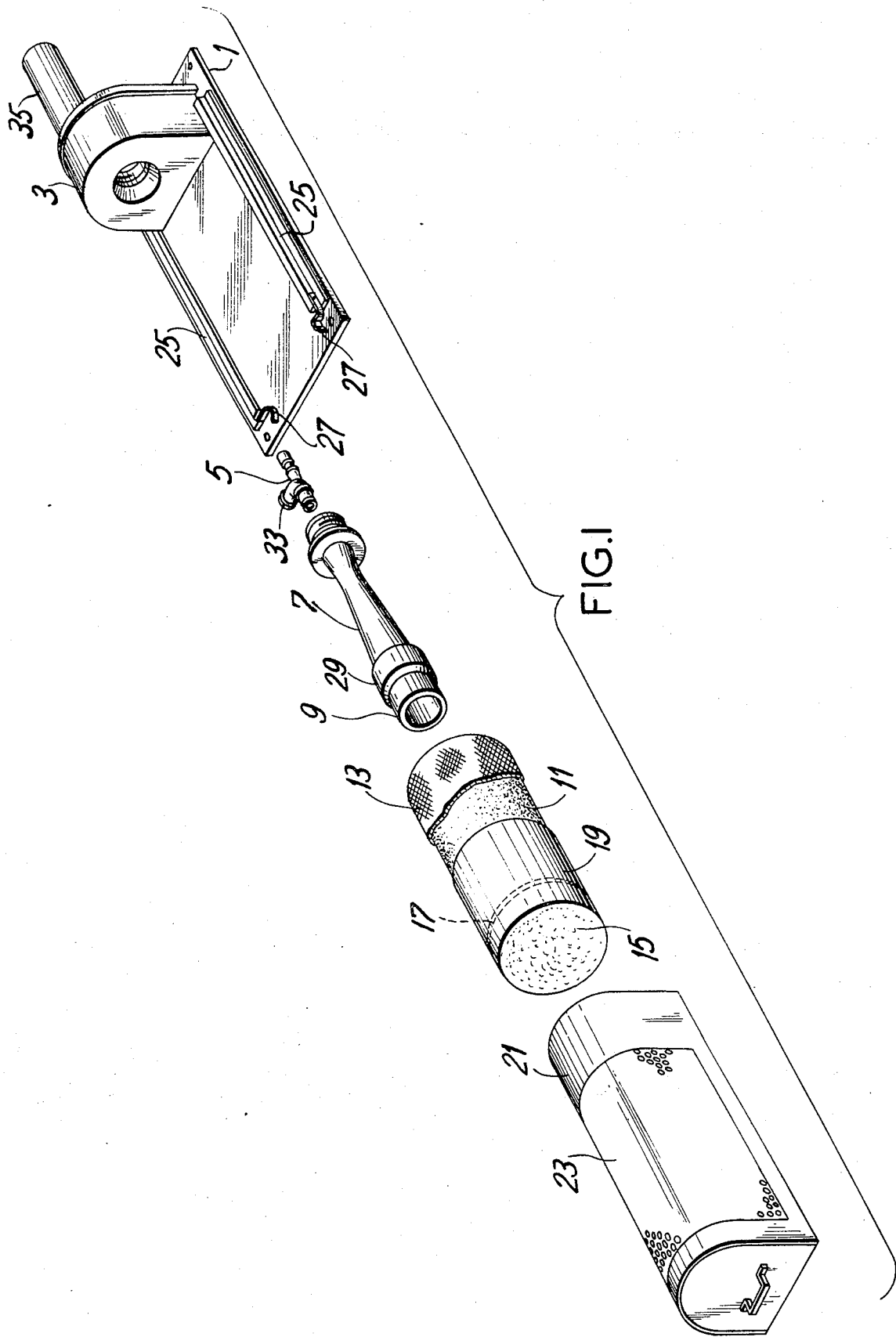
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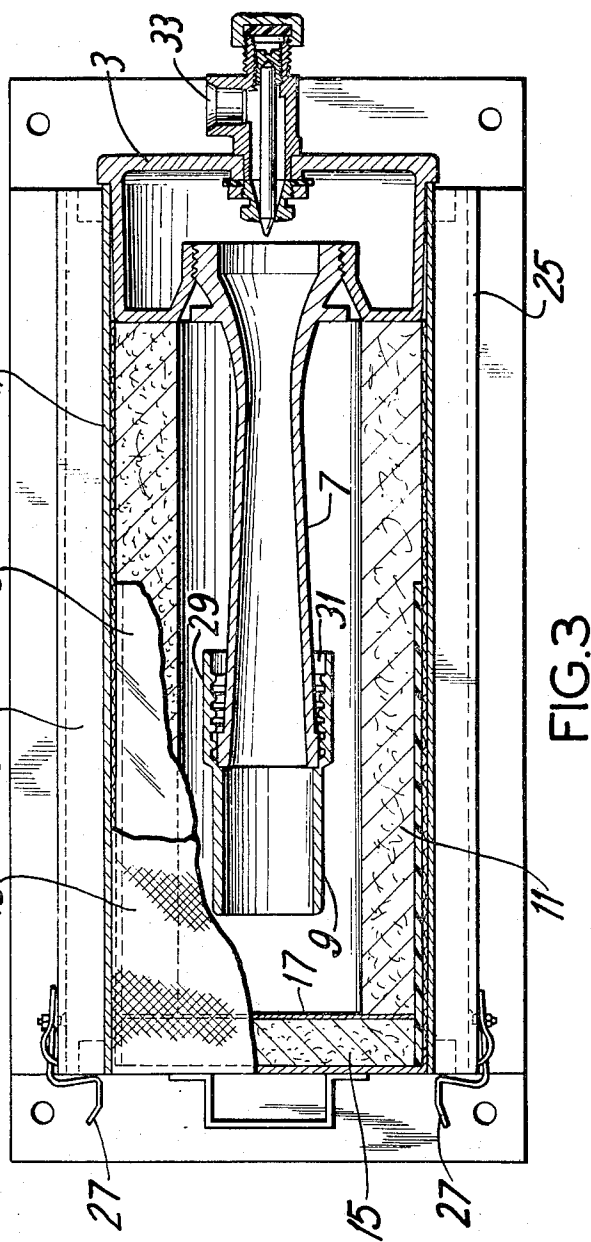
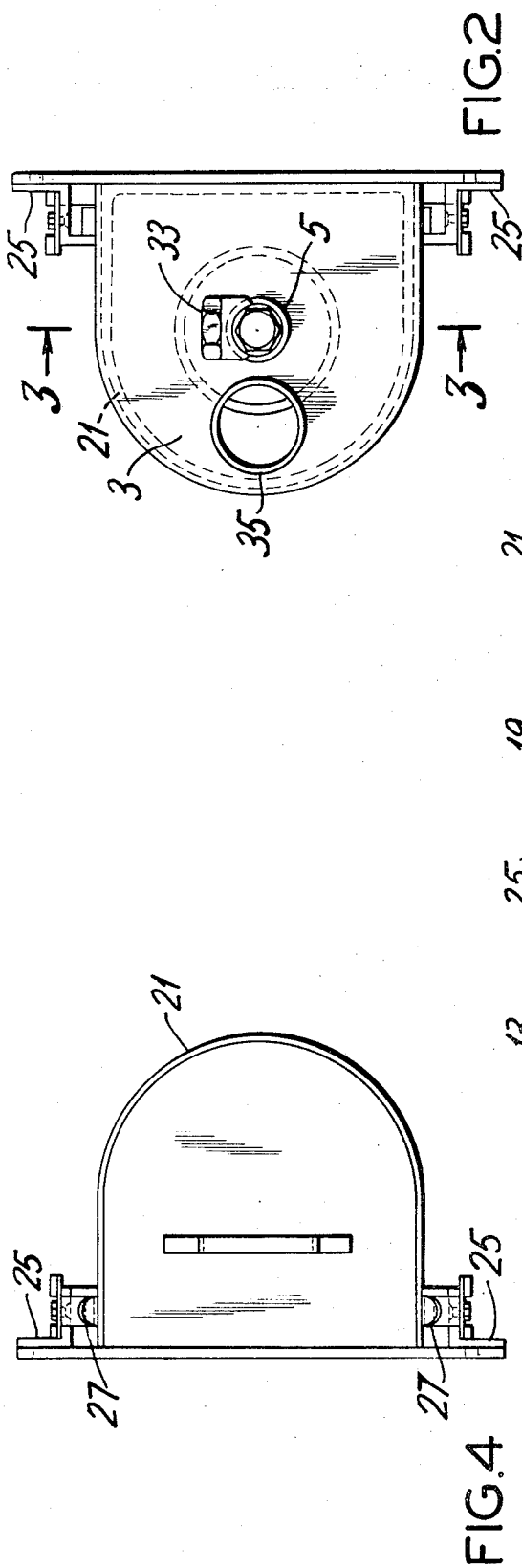
[57] ABSTRACT

Apparatus are provided for suppression of noise in a venturi-type vacuum generating power unit by means of application of a resilient tubular extension to the exhaust end of the venturi and/or enveloping a portion of a fiberglass muffler surrounding said exhaust end with a thin film of resilient plastic material.

8 Claims, 4 Drawing Figures







NOISE SUPPRESSED VENTURI POWER UNIT

BACKGROUND OF INVENTION

Pneumatic conveyor systems are today utilized in many industries for conveying a wide variety of materials. One of the most commercially accepted systems of this type involves the application of a central source of in-plant generated high pressure air which is fed to one or more vacuum generating devices of the jet or venturi type. The vacuum or partial vacuum thus generated is in turn used to convey and control the conveyance of materials in many different ways.

This principle of vacuum generation is well known in the art. Equally well known is the fact that such systems are generally prone to develop a relatively high noise level, which can add considerably to the general "noise pollution" created by the surrounding industrial equipment. This has necessitated the application of muffling devices in attempts to reduce the sound levels to acceptable limits.

Heretofore, it has not been feasible to achieve acceptable reduction of the noise level without resorting to expensive and rather bulky equipment or without sacrificing the efficiency of the vacuum generating system.

BRIEF DESCRIPTION OF INVENTION

The present invention provides means for effecting reduction in the noise levels created by venturi-type vacuum generating devices:

This result is accomplished by two means, either of which reduce the noise level significantly and both of which together mutually cooperate in achieving a substantial reduction in the noise level of the operating equipment.

One such means involves affixing to the exhaust end of the venturi a resilient tubular extension which has been found to reduce the decibels generated by the venturi by a significant degree. Another such means involves the application of a thin film of resilient plastic sheet material around a portion of the muffler normally used to surround the venturi, which also has been found to significantly reduce the noise level. The structural modifications to achieve these reductions in noise level do not affect the operating characteristics of the equipment with respect to induced air flow (vacuum generation) and deadend vacuum, when compared to the same equipment in unmodified form.

The foregoing and other features and objects of the invention will be pointed out more particularly and will become more apparent from the following more detailed description of the invention taken in conjunction with the accompanying drawings which form an integral part thereof.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view, in perspective showing the principal components of the invention.

FIG. 2 is an end view in elevation of the assembled components of FIG. 1 adapted for a side mounting.

FIG. 3 is a section taken along line 3—3 of FIG. 2.

FIG. 4 is a view in elevation of the other end of the assembled components shown in FIGS. 2 and 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the exploded view of FIG. 1, element 1

generally refers to a mounting bracket supporting a housing 3 adapted to receive an orifice assembly 5 and venturi jet assembly 7. The orifice assembly is of conventional design and connected to a source of high pressure air not shown in FIG. 1.

A tubular extension 9 of resilient material is mounted on the exhaust end of venturi 7 for noise suppression purposes. Extension 9 may be constructed of a variety of flexible, resilient materials, preferably plastic materials such as polyvinyl chloride, natural or synthetic rubbers such as neoprene rubber and the like. The wall thickness of the portion of the tubular extension 9 beyond the exhaust end of the venturi, should preferably be about one-eighth to three-sixteenths inch. For optimum noise suppression the length of extension 9 projecting beyond the exhaust end of the venturi is preferably from about 2¼ inch to 2½ inch, i.e. about 30 to 40 percent the length of the venturi 7 measured from the exhaust to intake ends of said venturi.

Spaced from the outer periphery of the venturi 7 and extension 9 is a cylindrical muffler 11 composed for example of fiberglass, advantageously fabricated from an air-permeable unsplit fiberglass pipe having a wall thickness of about one-third the inner diameter of cylinder 11. The outer surface of the cylinder is surrounded by an air permeable cloth covering 13 constructed for example, of cheese cloth, cotton twill or moleskin to retain the fiberglass in place under the high pressure air exhausted by the venturi. The end of cylinder 11 is sealed off by a disc 15 of fiberglass of similar thickness and having bonded to its inner face a film of plastic material or metal foil, such as aluminum foil 17 (as shown in FIG. 3) to prevent the jet of air exhausted by the venturi from disintegrating the fiberglass end wall 15 of the muffler 11. End wall 15 and film 17 are together suitably cemented to the end of cylinder 11 by methods well known in the art.

Beneath cloth covering 13 the outer periphery of the portion of cylinder 11 surrounding the exhaust end of the venturi 7 and extension 9 is enveloped by a film of resilient plastic material 19, such as polyethylene, polyvinylchloride and the like, preferably of about 0.010 inch in thickness. The plastic envelope should extend at least from the end wall 15 of the muffler or cylinder 11 to envelope the region of extension 9 which generally covers up to about 50 percent of the length of cylinder 11, extending from end wall 15. More specifically, the plastic film 19 should extend from the end of the muffler 11 adjacent the exhaust end of venturi 7 and up to about 40 to 45 percent the length of said venturi measured from its exhaust to intake ends, overlying extension 9. The plastic film 19 may be applied by winding a continuous strip of such material around cylinder 11; by surrounding the cylinder with overlapping sheet material; by sliding a tube of plastic material onto the cylinder, with or without an end wall suitably shaped to fit the outer end of the cylinder 11; or by other means which should be obvious from the description of this invention.

It is particularly advantageous to apply the envelope 19 of plastic sheet material before the cloth covering 13 is applied since the cloth will then retain the plastic firmly in place under the outwardly directed air-pressure delivered by the exhaust end of the venturi. However, if desired the cloth covering over the plastic film 19 could be omitted or the plastic film could be applied over a portion of the cloth covering 13 provided

that the plastic film is sufficiently snug when applied.

To complete the assembly, the cylindrical muffler 11 is preferably surrounded by a metal casing 21 provided with a perforated portion 23 to permit air to escape from the unit during operation. Casing 21 slidably engages bracket 1 within channels 25 and is retained in place by a spring means 27.

More detailed views of the assembled components appear in FIGS. 2, 3 and 4. Referring particularly to FIG. 3 there is shown an elevation view, partly in section, through the venturi 7, muffler 11 and casing 21 of this invention. Extension 9 is advantageously affixed to the exhaust end of venturi 7 by means of a skirt portion 29 molded of the same material and coupled to the venturi by means of a threaded portion such as a bushing 31 suitably affixed thereto. The skirt may also be coupled to the venturi by means of meshing rings and annular depressions between the two pieces.

In operation of the device, high pressure air at a pressure of about 60 lbs. per square inch is introduced to the orifice assembly 5 through a port 33 from which it is delivered through an adjustable needle valve in the orifice assembly to the intake of the venturi at about 35 cubic feet per minute standard atmospheric pressure. This generates an airflow of approximately 100 cubic feet per minute standard atmospheric pressure at the inlet 35 of the unit which is connected to various other equipment not shown.

Suitable mounting means are shown in FIGS. 2 and 4 for mounting the power unit in a side mounted position, but it should be apparent that the entire unit may be mounted in substantially any position.

The vacuum generating unit above described has been tested under a variety of conditions, both with and without the use of extension 9 and plastic film 19 and utilizing the extension 9 and film 19 both separately and in combination. In all instances it was found that the application of the extension and plastic film did not materially result in any back pressure on the venturi and substantially the same operating efficiency of the unit was retained even when these sound suppression means were employed. When inlet port 35 was completely blocked a deadend vacuum of approximately 10 inches of mercury was created whether or not extension 9 and/or plastic film 19 were incorporated in the device.

Without the introduction of the extension 9 and plastic film 19, a vacuum generating unit of the type described would normally generate sound levels of approximately 93 decibels. By employing the plastic wrapping 19 alone around the muffler cylinder 11, the sound level generated by the unit was reduced to approximately 83 decibels. The use of the extension 9 alone reduced the decibel rating to approximately 85. The use of both extension 9 and the plastic wrapping 19 together reduced the decibel rating to 76 decibels.

In some applications, it is commonplace in the art to utilize more than one vacuum generating unit of the

type described, assembling the same in tandem to provide multi-jet units of two or more jets each. It will be obvious that the present invention is readily adaptable to such designs, with similar advantageous results. In fact, testing of twin-jet units has demonstrated that the means employed for suppressing noise as described above were successful in reducing the sound level from 93 decibels to a range of 80 to 81 decibels.

Resort may be had to such modifications an equivalence as fall within the spirit of the invention and the scope of the appended claims.

Having thus fully described the invention, what is claimed and is desired to be secured by Letters Patent is:

1. In a vacuum generating power unit having a venturi actuated by a source of high pressure air and a muffler of air-permeable fiberglass surrounding said venturi, the improvement comprising a flexible, resilient tubular extension mounted on the exhaust end of said venturi and situated within the confines of said muffler, the end of said extension being spaced from the end of said muffler adjacent the exhaust end of said venturi.

2. A power unit according to claim 1 which is further provided with a film of resilient plastic material about the outer periphery of said fiberglass muffler extending from the end of said muffler adjacent the exhaust end of said venturi and overlying at least the said flexible resilient tubular extension.

3. A power unit according to claim 1 wherein said extension projects beyond the exhaust end of said venturi by a distance of about 30 to 40 percent the length of said venturi measured from its exhaust to intake ends.

4. In a vacuum generating power unit having a venturi actuated by a source of high pressure air and a muffler of air-permeable fiberglass surrounding said venturi, the improvement comprising a film of resilient plastic material about the outer periphery of said fiberglass muffler extending from the end of said muffler adjacent the exhaust end of said venturi and overlying at least the exhaust end of said venturi.

5. A power unit according to claim 4 which is further provided with a flexible resilient tubular extension mounted on the exhaust end of the said venturi and extending beyond said end and situated within the confines of said muffler, said film of resilient plastic material overlying said extension.

6. A power unit according to claim 4 which is further provided with a cloth covering overlying said film of resilient plastic material and retaining said film in place.

7. A power unit according to claim 5 which is further provided with a cloth covering overlying said film of resilient plastic material and retaining said film in place.

8. A power unit according to claim 4 wherein said film of resilient plastic material extends from the end of said muffler adjacent the exhaust end of said venturi and up to about 40 to 45 percent the length of said venturi measured from its exhaust to intake ends.

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