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Hedrick

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[54] **DIFFUSER APPARATUS FOR PNEUMATIC TOOLS**

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[52] **U.S. Cl.** .....**181/36 A**, 181/46 A, 181/60, 138/114, 137/561 A

[51] **Int. Cl.** **F01n 1/10**, F01n 7/18

[58] **Field of Search** .....138/112, 113, 114; 137/561, 137/561 A; 181/60, 46 A, 36

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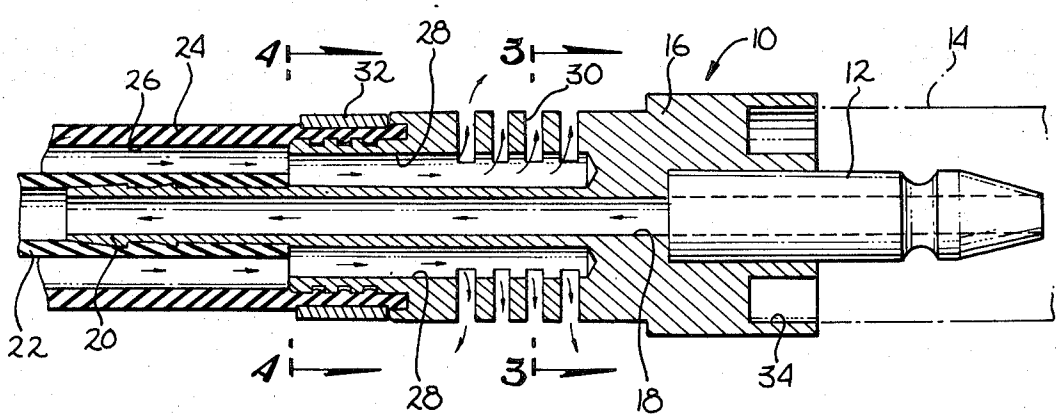
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[57] **ABSTRACT**

A diffuser apparatus to disperse a gaseous stream wherein the apparatus is formed as a single integral unit having an internally located supply passage, a gaseous exhaust passage surrounding the supply passage, a plurality of spaced apart annular openings communicating the ambient with the exhaust passage through the outer housing wall.

7 Claims, 4 Drawing Figures



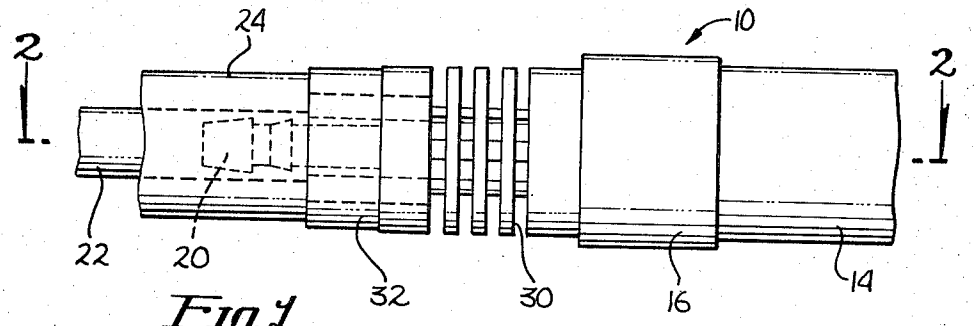


Fig. 1

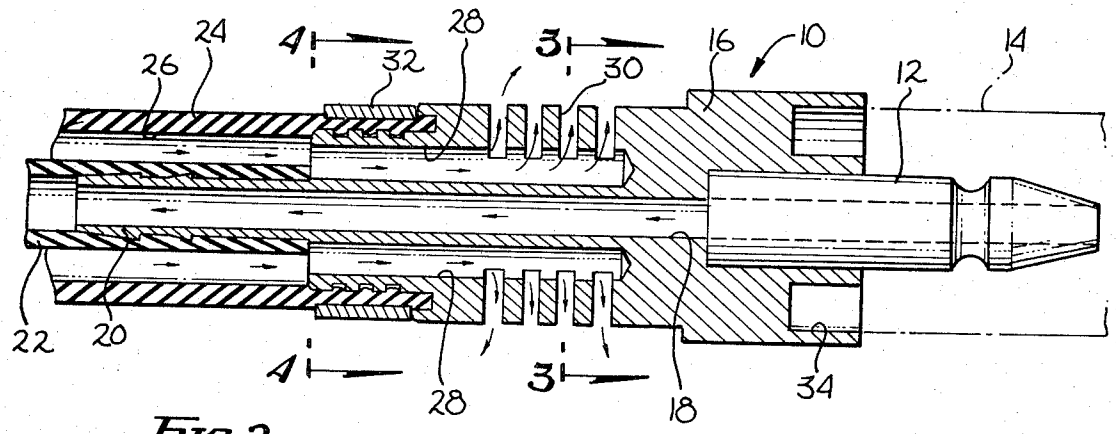


Fig. 2

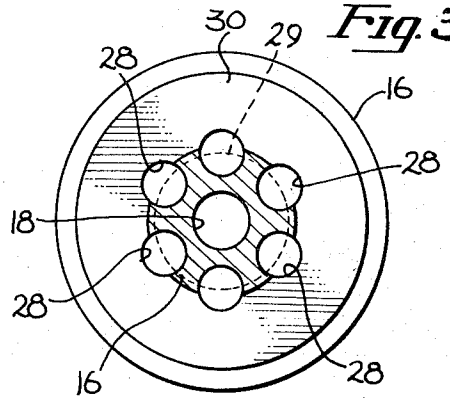


Fig. 3

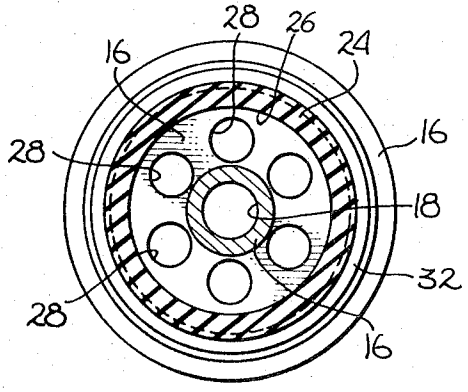


Fig. 4

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DIFFUSER APPARATUS FOR PNEUMATIC TOOLS

BACKGROUND OF THE INVENTION

The field of this invention relates to diffusers for a gaseous fluid and more particularly to a diffuser apparatus to be employed in combination with a pneumatically driven tool assembly.

Portable pneumatic tools are in extremely common use. Such a tool usually takes the form of a hand held tool such as a drill which includes a motor assembly formed within the drill. For example, dentists normally employ the use of such an apparatus to drill into a person's teeth to permit insertion of a metallic fitting to eliminate continual tooth decay. Also, in the field of medicine medical doctors frequently use air driven drills. An example of a medical type of air driven tool would be an abrasive wheel which is either electrically or pneumatically driven and usable by surgeons for performing skin grafts.

Such pneumatically driven tools must include passage structure to supply the pressurized gas to the motor assembly and also include passage structure which facilitates exhausting of the pressurized fluid after passing through the pneumatic motor. It has been common for such portable tools to include a flexible conduit connecting the tool to the source of pressurized fluid. The pressurized gas, after use, is merely exhausted into the ambient adjacent the grasping portion of the tool. It has been found that such an arrangement is undesirable as the gas is exhausted in the form of a jet which results in a hissing type noise. Because such tools are frequently used to perform tedious operations which require a high degree of concentration on the part of the operator, such a noise is distracting. Further, it is common for the jet of exhausted gas to form a cloud or mist upon being emitted into the ambient. Such a cloud or mist is also undesirable.

In an effort to overcome the above noted disadvantages, it has been found to be desirable to conduct the exhaust gas through an exhaust aperture and then emit such into the ambient atmosphere adjacent the source of pressurized fluid which is normally displaced a substantial distance from the patient upon which the tool is being employed. As a result, the noise that is emitted is less disturbing and the cloud or mist is less distracting. However, ever present to some extent is both the cloud and the noise.

Previously, in an effort to overcome the disadvantages of the cloud and the noise, it has been found to be desirable to conduct the exhaust gas through a diffuser apparatus. The function of the diffuser apparatus is to substantially decrease the noise level of the gas emission as well as to eliminate the cloud or mist. It has been common to supply the pressurized gas to the motor assembly through a cylindrical opening with the exhaust opening being located about the inlet opening thereby resulting in the forming of an annular exhaust passage. The diffuser apparatus serves an additional function of facilitating a supplying of the gas as well as the diffusing of the exhaust gas. Normally, such diffusers merely include a housing upon which are located a plurality of spaced apart apertures which connect the ambient to the exhaust passageway. Inherently produced turbulence that the exhaust gas must incur passing through the apertures causes a decrease in the noise level and a substantial reduction in the cloud or the mist.

It has been found that the use of such a diffuser apparatus, as previously described, does not operate with the greatest efficiency. Although the noise level and the cloud is substantially reduced, further reduction would be desirable. Further, such diffuser apparatuses are formed of a plurality of parts which results in a unit more complex than desired. Such complexity increases manufacturing cost.

It would be desirable to design a diffuser apparatus which overcame the above noted disadvantages and efficiently diffused the gaseous fluid during emission into an ambient, so that substantially no noise is created as well as no cloud or mist.

SUMMARY OF THE INVENTION

The diffuser apparatus of this invention is to be formed within a housing which includes an inlet passageway and an exhaust passageway. The inlet passageway is centrally located within the housing with the exhaust passageway surrounding such in an annular configuration. The exhaust passageway is to be separate and non-communicating with the inlet passageway. The entire diffuser apparatus is formed as an integral unit of a rigid material such as metal or plastic. The exhaust passageway is actually formed into a plurality of spaced apart longitudinal passages. Each of the longitudinal passages are to communicate with a plurality of spaced apart annular transverse openings. The transverse openings connect the ambient to the exhaust passageway.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall longitudinal view of the diffuser apparatus of this invention as it would be installed in combination with a conduit for supplying and exhausting fluid to and from a pneumatically operated tool;

FIG. 2 is a longitudinal cross-sectional view of the diffuser apparatus of this invention taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2 showing in more detail an aspect of the apparatus of this invention; and

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2 showing in more detail another aspect of the apparatus of this invention.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENT

Referring particularly to the drawing, there is shown in FIG. 1 the diffuser apparatus **10** of this invention being connected by means of a fitting **12** to a supply conduit **14**. The supply conduit **14** is to be connected to a source of pressurized gas not shown. The conduit **14** will normally be of a flexible material such as rubber or the like.

The gaseous medium from the supply conduit **14** is conducted through the fitting **12** into the inlet passageway **18** formed within the diffuser housing **16**. A second fitting **20** is integrally formed upon the diffuser housing **16** and is adapted to facilitate connection with the inlet conduit **22**. The gas passes from inlet passageway **18** into the inlet conduit **22**. The inlet conduit **22** is to be connected to the motor assembly of a pneumatically driven tool (not shown). The inlet conduit **22** will normally be of a flexible material such as rubber or the like.

An exhaust conduit 24 is located about the inlet conduit 22 with an exhaust passageway 26 being formed therebetween. The exhaust passageway 26 communicates with a plurality of spaced apart longitudinal openings 28 formed within the diffuser housing 16. As illustrated in FIG. 3, the diffusion apparatus 10 can include six of the longitudinal openings 28 equally spaced on the circumference of an imaginary circle 29 which may be concentric with the inlet passage 18.

Formed within the housing 16 and communicating with each of the openings 28 are a plurality of annular openings 30. Each of the openings 30 is substantially washer shaped and permits conductance of the exhaust gas from the exhaust openings 28 into the ambient. It is to be noted that four such annular openings 30 are employed. However, the number of such openings 30 is to be considered a matter of choice or design. The openings 30 are located substantially transverse to the direction of gas flow passing through the openings 28. Also, the inside radius of the annular openings 30 is preferably less than the sum of the radius of one of the openings 28 and the radius of the imaginary circle 29. In fact, in a preferred embodiment, the inside radius of the openings 30 is substantially equal to the radius of the imaginary circle 29. This has been found to be desirable as the exhaust gas then becomes turbulent as it passes through openings 30, which therefore tends to decrease noise and decrease the cloud or mist which would normally occur.

The exhaust conduit 24 is fixedly retained upon the housing 16 by means of a clamp ring 32. Also, the supply conduit 14 is to matingly cooperate with an annular recess 34 formed within the housing 16.

The operation of the diffuser apparatus 10 of this invention is as follows: It will be assumed that the apparatus 10 is installed as shown in FIGS. 1 and 2 of the drawing. The gas is being supplied through the supply conduit 14, through fitting 12 and into the inlet passageway 18. The gas from the inlet passageway 18 is then conducted within the inlet conduit 22. From the inlet conduit 22 the gas is conducted to a motor assembly (not shown) to effect operation of a pneumatically driven tool.

The gas, after passing through the motor assembly, is then caused to be conducted through the exhaust passageway 26 within the exhaust conduit 24. The gas within the exhaust passageway 26 is then conducted into the longitudinal openings 28. It is to be noted that a certain amount of diffusing of the exhaust gas occurs by its being caused to enter the openings 28. From the openings 28 the exhaust gas is then conducted into the ambient through the annular openings 30. It is required that the exhaust gas make a substantial change in direction by being conducted from the openings 28 through the openings 30. This change of direction as well as the turbulence created by being conducted through the openings 30 causes the gas to be emitted into the atmosphere substantially without noise and without producing a cloud or mist.

What is claimed is:

1. A diffuser apparatus for attachment to a pneumatically operated device to disperse a gaseous stream exhausting therefrom, comprising:

a housing;

an inlet passageway formed within said housing and communicating with said device to permit conducting of a gas through said inlet passageway to said device;

an exhaust passageway formed within said housing and adapted to be flow-connected to said inlet passageway to permit conducting of a gas therethrough, said exhaust passageway being separated from said inlet passageway, said exhaust passageway disposed outwardly of said inlet passageway; and

portions of said housing defining at least one annular opening communicating with said exhaust passageway for conducting the gas from said exhaust passageway into the ambient.

2. An apparatus as defined in claim 1, wherein the portions of the housing define the annular openings to extend substantially transverse to the direction of the gas flow through the exhaust passageway to produce turbulence in the flow of the exhaust gas and thereby substantially reduce the noise associated with the exhausting of the gas.

3. An apparatus as defined in claim 2 wherein the portions of the housing define a plurality of the annular openings axially spaced with respect to each other and extending radially outwardly from each of the exhaust passageways.

4. A diffusion apparatus for use with a gas operated device to suppress the noise associated with the exhausting of the gas therefrom, comprising:

a housing;

first portions of the housing defining an inlet passageway for conducting the gas to the device for the operation thereof;

second portions of the housing disposed outwardly of the first portions of the housing and defining at least one exhaust passageway separated from the inlet passageway and communicating with the device to receive the gas therefrom; and

third portions of the housing defining at least one annular opening communicating with and extending, transversely of each of the exhaust passageways for receiving the gas from the exhaust passageways and abruptly changing the direction of the gas as it is exhausted to the ambient.

5. The apparatus set forth in claim 4 wherein the second portions define a plurality of the exhaust passages spaced from each other in axial cross section on the circumference of an imaginary circle and the inlet passageway is defined interiorly of the imaginary circle.

6. The apparatus recited in claim 5 wherein the third portions of the housing define the annular openings with an inner radius and an outer radius, the inner radius being substantially equal to the radius of the imaginary circle and concentric therewith so that the annular openings communicate with each of the exhaust passageways.

7. The apparatus set forth in claim 6 wherein the annular openings extend radially outwardly of the exhaust passageway and the inlet passageway is concentric with the imaginary circle.

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