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Sneckenberger

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[54] **NOZZLE NOISE SILENCER**

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[52] **U.S. Cl.** ..... **181/47 B;** 181/36 A; 51/11; 239/589; 239/DIG. 21

[51] **Int. Cl.²** **F01N 1/00**

[58] **Field of Search** ..... 181/35 R, 36 R, 36 A, 181/36 B, 41, 47 R, 47 B, 72; 15/326; 51/11; 239/591, DIG. 21, 589

[56] **References Cited**

UNITED STATES PATENTS

2,543,517 2/1951 Anderson ..... 239/591 UX

3,628,627 12/1971 Arnold ..... 181/36 R

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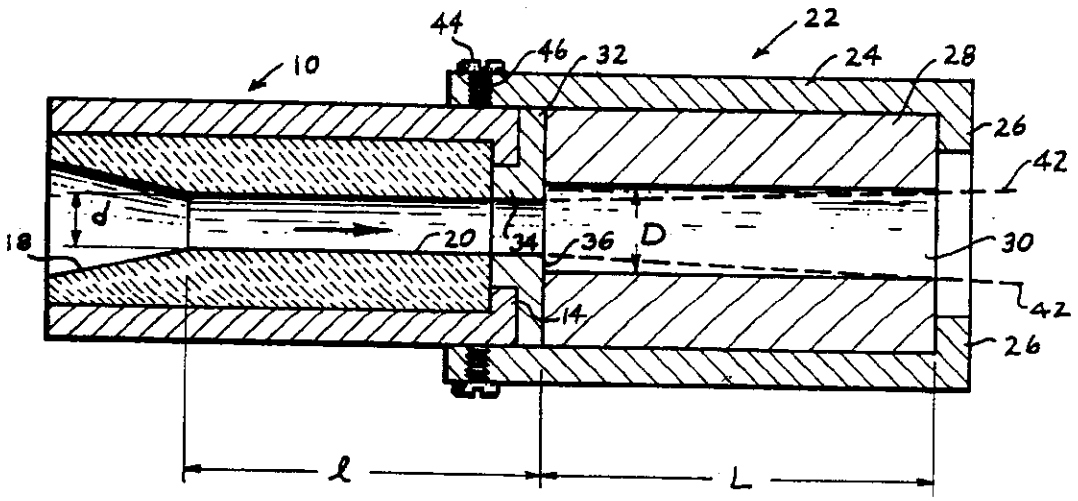
Attorney, Agent, or Firm—David E. Dougherty; William H. Holt

[57] **ABSTRACT**

A silencer device for attachment to a nozzle, or a combined nozzle and silencer, are provided for reducing the noise generated by compressed air or a compressed air-particulate mixture exiting from conventional nozzles of the type used for air blasting, sandblasting, or peening operations. The silencer has a bore of substantially constant diameter which is, within limits, larger than the nozzle bore for which the silencer is designed.

5 Claims, 3 Drawing Figures



NOZZLE NOISE SILENCER

BACKGROUND OF THE INVENTION

Silencers for air guns used in the surface treatment of articles by abrasive blasting are known in the prior art, as is exemplified by U.S. Pat. No. 3,628,627, this patent having been granted on Dec. 21, 1971.

SUMMARY OF THE INVENTION

The present invention relates to a silencer for blast nozzles to reduce the noise created by a discharge of compressed air or a discharge of a compressed air-particulate mixture in order to overcome at least two problems presently existing in the art, namely, (1) the unacceptable high level of noise which is either injurious to workers or requires the use of silentproofing equipment, and (2) the somewhat related problem of the upper limit of pressures now in common use in industry because of the even greater amount of noise associated with higher pressures. Thus, the present invention contemplates either the reduction of noise at present air pressure levels or the use of higher pressures without a corresponding increase in the noise level.

More particularly, the present invention relates to the provision of a silencer for a nozzle, or a combined nozzle and silencer, wherein the silencer is comprised of a body member having a silencer bore diameter which is substantially constant throughout its length and is larger than the nozzle exit diameter within a range between approximately 110 percent and 350 percent.

A further object of the invention is to provide a silencer device of the type described above wherein the bore of the silencer is of a length between 60 percent and 200 percent of the length of the nozzle bore.

A still further object of the invention is the provision of a combined nozzle and silencer which may be, alternatively, formed in an integral one-piece construction or as separate members which are adapted to be connected together.

REFERENCE TO THE DRAWINGS

FIG. 1 is a cross-section of a conventional blast nozzle which is known in the prior art.

FIG. 2 is a sectional view of a combined nozzle and silencer wherein the nozzle portion and silencer portion are of separate construction and connected together in an operative manner.

FIG. 3 is a sectional view, similar to FIG. 2, wherein the nozzle and silencer are formed as an integral one-piece unit.

DETAILED DESCRIPTION OF THE INVENTION

A known type of blast nozzle, generally indicated by the numeral **10**, is shown in FIG. 1 as being comprised of an annular jacket **12** which is usually cylindrical about its central axis and has inturned end portions **14** for encapsulating a wear-resistant ceramic liner **16**. Liner **16** may be formed of such materials as tungsten carbide or boron cabide, and is shown as including a tapered section **18** which converges to a constant diameter nozzle portion **2**. Nozzles **10** are well known and are used extensively in industry for such operations as air blasting, sandblasting, peening, etc. These nozzles are known to create a large amount of noise, in excess of 100 dBA, when used with compressed air at pressure

ranging up to, or exceeding, 100 psi., a conventional operating pressure being approximately 80 psi.

As is shown in FIG. 2, a novel silencer device, generally indicated by the numeral **22**, includes a jacket **24** which may be cylindrical, as shown, or may be of any other shape, and includes inturned end portions **26** for encapsulating therein a body member **28** which is provided with a nozzle bore **30**, the bore **30** being of a substantially constant diameter D and having a nozzle bore length L. As an expedient for adapting the silencer **22** to a conventional nozzle **10**, there is provided a washer member **32** having a reduced portion **34** which is made to fit within the inturned end portions **14** such that there is a right-angle transition **36** at the planar interface of the nozzle bore **20** and silencer bore **30**. For purposes of this disclosure, the nozzle bore **20** is shown as having a constant diameter *d* and a length *l*, the length being measured from the smallest diameter of the tapered portion **18** to the exit end of the nozzle bore **20** including the length of the washer member **32**.

In operation the nozzle **10** is usually connected by its threaded end portion **40** to a hose or pipe (not shown) which carries high pressure air, or high pressure air and particulate matter such as abrasive grit, sand, or peening particles. As the air, or air and particulate mixture, enters the tapered portion **18**, the fluid is compressed and its velocity is increased until it exits from the exit end of the nozzle and then a slight expansion occurs within the silencer bore **30**. As will be apparent to those skilled in the art, the expanded flow is illustrated diagrammatically by the broken lines **42**. While not illustrated as such, it is to be understood that when using an air-particulate mixture it may be preferable to form the body member **28** eithe totally or partially of a wear-resistant ceramic material such as that used for the liner **20**.

Silencer **22** must, necessarily, be fixedly attached to the nozzle **10**, one suitable means for attachment being shown as comprised of a set screw **44** fastened within a threaded bore **46** in the jacket **24**.

FIG. 3 illustrates an integral one-piece combined nozzle and silencer device, generally indicated by the numeral **50**, the device **50** including a nozzle portion **52** and a silencer portion **54**. Nozzle portion **52** includes a nozzle bore **56** having a substantially constant diameter d and a nozzle length l, while the silencer portion **54** is illustrated as having a substantially constant diameter D and a nozzle length L. In the same manner as described heretofore with regard to the embodiment of FIG. 2, the interface between the exit end of the nozzle bore **56** and the entrance of the silencer bore **54** is planar as is shown at **58**.

It is to be understood that the device **50** may be constructed of various types of materials including plastics. when used solely for compressed air, or may be formed of hardened metals or ceramic materials when the device **50** is used with an air-particulate mixture.

It is believed that there is a somewhat critical relationship between the silencer bore diameter D and the nozzle bore diameter *d*, and a somewhat less critical relationship between the silencer bore length L and the nozzle bore length *l*, and a somewhat critical relationship between these parameters and the particular operating pressures. Two examples of the interrelationship between the various parameters will be described hereinafter.

One standard nozzle, having $d = \frac{3}{8}$inch and $l = 2.5$ inches registered a sound level of 95.5 dBA with only compressed air at 80 psi. One silencer, having D = ⅝ inch and $L = 2.7$ inches reduced the sound level by 8.5 dBA to a reading of 87 dBA.

A different standard nozzle, having $d = 5/16$ and $l = 2.5$ inches registered a sound level of 107.5 dBA using compressed air at 50 psi. A second silencer, having $D = 39/64$ inch and $L = 3$ inches reduced the sound level by 19 dBA to a reading of 88.5 dBA.

While the invention has been described herein with references to various preferred embodiments and specific examples, it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit and scope of the invention as defined in the following claimed subject matter.

I claim:

1. A nozzle noise silencer device for reducing noise created by a flow of fluid from a nozzle which includes a nozzle bore having a length *l* and a nozzle exit diameter *d*; said silencer device comprising a body member having a silencer bore extending therethrough and having a silencer bore length L and a silencer bore diameter D, the improvement comprising said silencer bore diameter D being substantially constant throughout its entire length and being larger than said nozle exit diameter *d* within a range between 110 percent and 350 percent.

2. A silencer device as defined in claim 1 wherein the silencer bore length L is between 60 percent and 200 percent of the nozzle bore length *l*.

3. A combined nozzle and silencer device for reducing sound created by fluid flow therethrough, said device comprising a nozzle portion and a silencer portion, said nozzle portion including a nozzle bore having a nozzle bore length *l* and an exit bore diameter *d*, said silencer portion including a silencer bore having a silencer bore length L and a silencer bore diameter D; the improvement comprising said silencer bore diameter D being substantially constant throughout its entire length and being larger than said nozzle exit diameter *d* within a range between 110 percent and 350 percent.

4. A combined nozzle and silencer device as defined in claim 3 wherein said nozzle portion and said silencer portion are of an integral one-piece construction.

5. A combined nozzle and silencer device as defined in claim 3 wherein said nozzle portion and said silencer portion are of separate construction, and means are provided for connecting said nozzle portion of said silencer portion.

* * * * *

FIG. 1
(PRIOR ART)

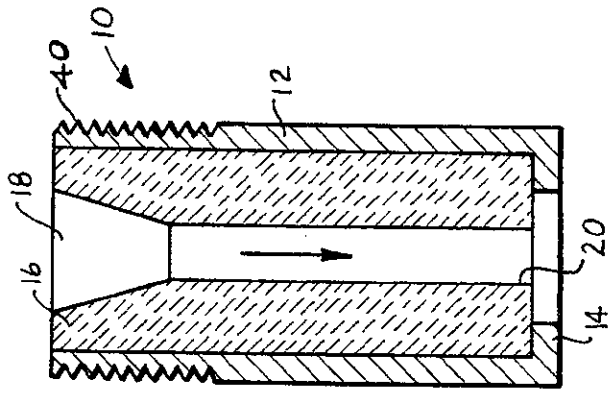


FIG. 3

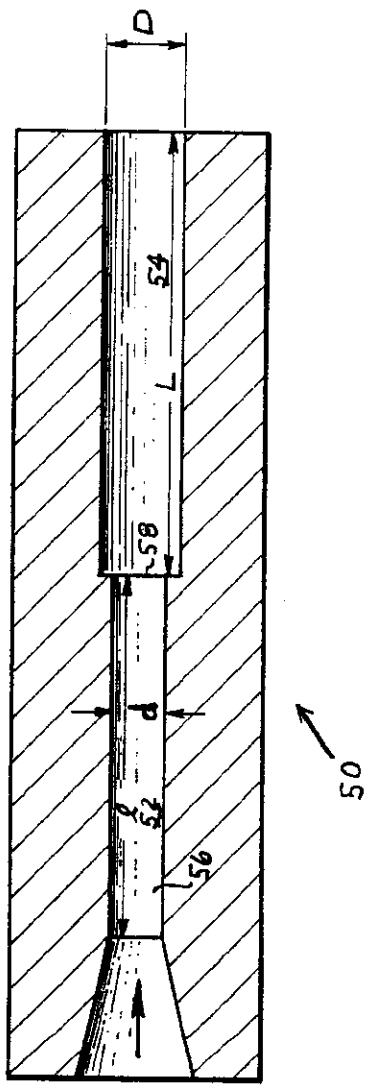


FIG. 2