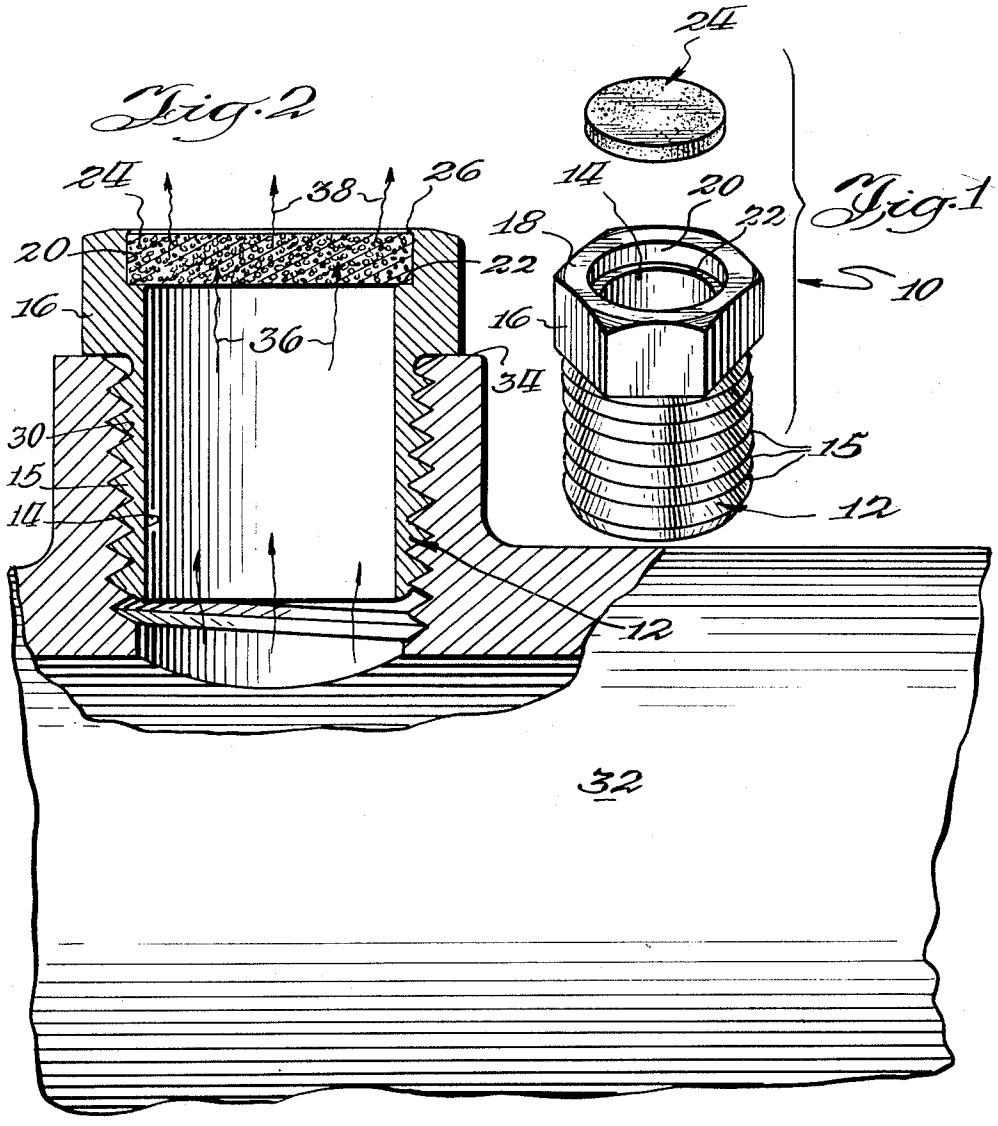
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EXHAUST VALVE SILENCER WITH SINTERED METAL SILENCING DISC

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Inventor
Seymour F. Stryker
By Silverman, Mullin, Cass & Kaufman
Attorneys

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EXHAUST VALVE SILENCER WITH SINTERED METAL SILENCING DISC

Seymour F. Stryker, Evanston, Ill., assignor to Air-Mite Devices, Inc., Chicago, Ill.

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The invention relates generally to gaseous fluid exhaust silencers and more particularly, relates to an improved silencer device for use in conjunction with a variety of types of exhaust valves for pneumatic apparatus such as, compressed air-powered presses and cylinders.

The silencer device of the character with which the invention is concerned is especially adapted for use with quick exhaust valves or exhaust control valves to effectively silence blasts of exhaust air from such a valve occasioned in the operation of compressed air-powered equipment, for instance. The silencer device embodying the invention would be useful in conjunction with reciprocating valves of the type disclosed in U.S. Patent No. 2,965,131, which patent is owned by the assignee of the herein application. Such valves have been advantageously used in air return cylinder actuation for compressed air presses, for instance. In the normal operation of such air-powered apparatus, it is necessary to frequently discharge exhaust air under pressure, frequently referred to as dumping the air, with resulting sudden and loud noise. Such blasts of air exhausted from an air cylinder are very disconcerting to personnel in the vicinity of operation of the air-powered equipment and as well, the blasts of air create turbulent effects which can raise clouds of dust and light-weight debris against which the air blasts impinge.

It has been known to use various sound muffling materials such as wire gauze, plastic foam materials and sintered non-compacted metal powders to achieve restrictions or silencing effects in various kinds of fluid powered equipment. However, such materials have been somewhat difficult to work with and have required suitable enclosures, such as in the case of powdered sintered metal, to prevent efflux of the silencing material upon exhausting of the gaseous fluid. Further, such air silencing materials have not been convenient to handle and install in the silencer device so that generally, such previously known silencer devices have been somewhat expensive to manufacture and less than satisfactory in many practical respects.

Accordingly, it is a major object of this invention to provide a silencer device for exhaust valves such as used in air-powered equipment which will substantially eliminate all of the disadvantages hereinabove enumerated.

An important object of the invention is to provide a compressed gas silencer of the character described comprising, a nipple having a bore therethrough and means adjacent one end of the nipple for coupling said device with the exhaust port of an exhaust valve, said nipple having an enlarged formation at the opposite end thereof having a seat in the end face thereof in which a silencing disc is secured flush with said end face.

Another object of the invention is to provide an air silencer device of the character described in which said seat is larger in diameter than the diameter of said bore, and said disc comprises a compacted, sintered metal of a configuration having a uniform thickness substantially equal to the depth of said seat and seated across the discharge end of said bore.

Further objects of the invention reside in the provision of an air silencer of the character described which is materially more simple and economical to manufacture and use, which is capable of being used effectively in conjunction with various types of exhaust valves, and which is

very efficient in reducing and/or eliminating the characteristic high blasting noise of suddenly exhausted or dumped compressed air or other gaseous fluid from powered apparatus.

The foregoing and other objects of the invention will become apparent from the ensuing disclosure in which a preferred embodiment of the invention has been described in detail in the specification and illustrated in the accompanying drawing. It is contemplated that minor variations may be made in structural features of size, construction, proportion and arrangement of parts thereof, which will not depart from the spirit or sacrifice any of the advantages of the invention.

In the drawing:

FIG. 1 is an exploded perspective view of the silencer device embodying the invention.

FIG. 2 is an enlarged fragmentary sectional view taken longitudinally through the silencer device of the invention as installed in the exhaust port of a valve, said valve being illustrated in a more or less diagrammatic manner.

Referring to the drawing, the silencer device embodying the invention is designated generally by the reference character **10**. As seen in FIG. 2, said device then is comprised of an externally threaded cylindrical body or nipple **12**, preferably of metal, having a central bore **14** of uniform diameter therethrough. Although the nipple **12** has been shown to have external threads **15** thereon, it is contemplated that said nipple may have other suitable means for coupling same with the exhaust port of a valve body, depending upon the character of said port. At one end thereof, said nipple **12** has an enlarged formation or head **16** in the shape of a polyhedral nut. It will be appreciated that the head **16** may be shaped in another manner, the head being suitably shaped for engagement thereof by a wrench or other tool for tightly coupling the device with the exhaust port of the valve. The flat end face **18** of the head **16** has an annular seat or recess **20** therein, the diameter of which is larger than the internal diameter of the bore **14** so as to provide the shoulder **22** at the juncture of the bore **14** and the seat or recess **20**. Adapted to be engaged in the seat **20** is an air silencer disc or wafer, designated generally **24**, which will seat across the discharge end of the bore **14**. It will be seen that head **16** surrounds said discharge end of the bore.

This disc or wafer **24** preferably is circular in configuration and dimensioned to match or conform with the configuration of the annular recess **20**. The thickness of the wafer **24** is substantially equal to or slightly less than the depth of the seat **20** from shoulder **24** to the end face **18** of said head **16**. Said disc **24** is formed of a sintered metal powder compacted together to permit the disc to be handled without crumbling or falling apart. The disc **24** is quite porous and may be formed of any one of a group of suitable metal powders such as bronze, nickel, steel or the like, or suitable metal alloys. I have found that bronze powder provides a very satisfactory air silencing disc **24**.

The disc **24** is assembled to the nipple **12** by engaging the disc in the annular recess **20** supported on the shoulder **22**. To lock the disc **24** in the recess **20**, the marginal edge of the recess **20** is rolled or deformed as indicated at **26** engaging upon the upper perimetric edge of the disc. It will thus be seen that it is a simple and convenient matter to provide the nipple **12** with the recess **20** opening to an end face of an enlarged end thereof, and merely dropping the disc into the seat **20** and thereafter rolling the edge of the recess **20** to complete the assembly.

Referring to FIG. 2, the reference character **30** represents generally the exhaust port of a valve body **32**. The exact shape and size of the valve body may vary within

wide limits, such as, for instance, it can the form shown in said Patent 2,965,131. In any event, it should be understood that the reference character 32 designates a representative valve body having a threaded exhaust port 30 into which the threaded nipple 12 can be screwed. In the type of installation shown in FIG. 2, it will be seen that the head 16 is tightly engaged with the end face 34 of the valve body 32. This can be accomplished with a suitable wrench. The arrows 36 represent air blasts from the valve body 32 which will pass from the exhaust port 30 through the air silencer disc 24. The compacted sintered metal powder from which the disc 24 is formed provides a plurality of tortuous passageways therethrough of capillary dimension. The blasts of air 36 must pass through the disc 24 in order to escape from the port 30 and in this passage through the disc 24 must take a circuitous or tortuous path of movement. This tortuous movement serves to muffle or silence the usual noise from such a sudden dumping or exhausting of compressed air from an air-powered apparatus and diffuses the air passing therethrough, as indicated at 38, so that it loses its momentum and noise making capabilities. The disc is prevented from popping or blowing free of the head 16 by the rolled edge 26 which engages tightly and effectively around the perimetric edge of the disc 24.

It should be noted that the flush mounting of the disc 24 in the head 16 eliminates any protruding portions of the disc which could be chipped or broken away from the silencer device 10. This is advantageous because such valve bodies 32 may be subject to rough handling or contact with other bodies in the locale in which the air-power equipment is in use. The sintered metal powder in compacted form is strong and will resist considerable abuse and rough handling, however, it is not as strong as solid metal, for instance, metal from which the nipple 12 would be made. However, in the event that the disc 24 is broken in some way, it is feasible to reshape the rolled edge 26 to permit another disc 24 to be installed in the recess 20 and thereafater, roll the marginal edge of said recess to lock the disc in place.

It is believed that the invention has been described in sufficient detail to enable the person skilled in the art to understand and practice the same with resulting economy and facility as described hereinabove. The invention has been distinctly pointed out in the claims hereto appended in language intended to be liberally construed commensurate with the advance in the arts and sciences contributed by the invention.

What it is desired to secure by Letters Patent of the United States is:

1. A silencer device for installation at the exhaust port of a compressed air exhaust valve: said device comprising a body member having a bore therethrough and means at one end of the body for coupling same to said valve with the bore communicating with the port, said member having a head formation at a second end thereof, said formation having a recessed seat in an end face thereof, and a compacted, sintered metal disc secured in said seat across the discharge end of said bore and substantially flush with said end face, said seat having a rolled marginal inner edge frictionally engaged with said disc to retain the disc in the seat.

2. A silencer device of the character described comprising an externally threaded metal nipple having a central bore therethrough, a polyhedral nut formation integral with one end of the nipple and surrounding the discharge end of said bore, said formation having a planar end face provided with an annular recess therein, the recess being larger in diameter than the bore to provide an internal shoulder spaced inwardly from said end face, and a compacted, powdered metal disc fixedly secured in said recess flush with said end face and across said discharge end of the bore, said recess having an inner lip surrounding the perimetric edge of the disc and rolled to engage said disc.

3. A device as described in claim 2 in which said disc and recess substantially conform in configuration and dimensions.

4. A gas silencer device for installation on the exhaust port of an exhaust valve of the character described comprising, a nipple having a central bore therethrough, said nipple having a head formation at one end thereof, said head having a recessed seat in an end face thereof, and a compacted sintered metal disc cooperatively engaged in said recess across said bore and substantially flush with said end face.

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LEO SMILOW, *Primary Examiner.*