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2,789,653

MUFFLER ATTACHMENT FOR AIR DRIVEN TOOLS OF THE IMPACT TYPE

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FIG. 1

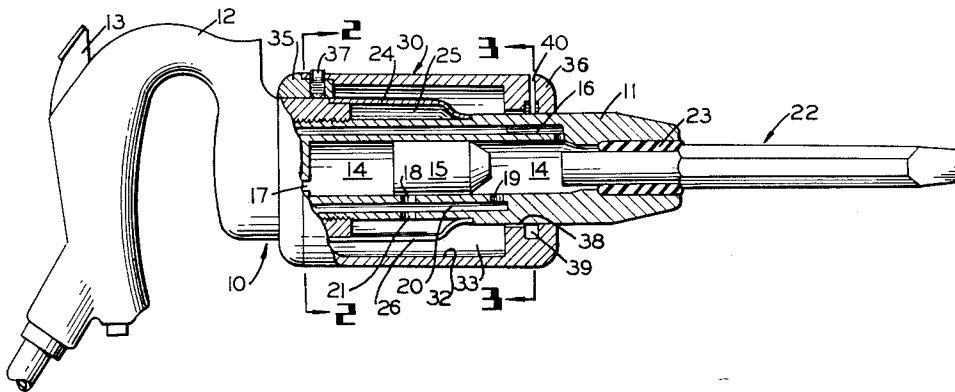


FIG. 2

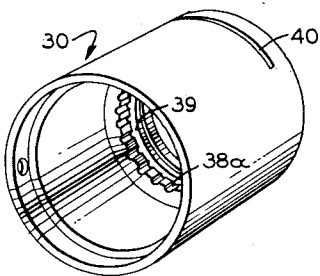


FIG. 3

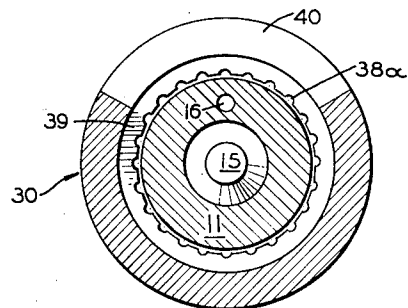
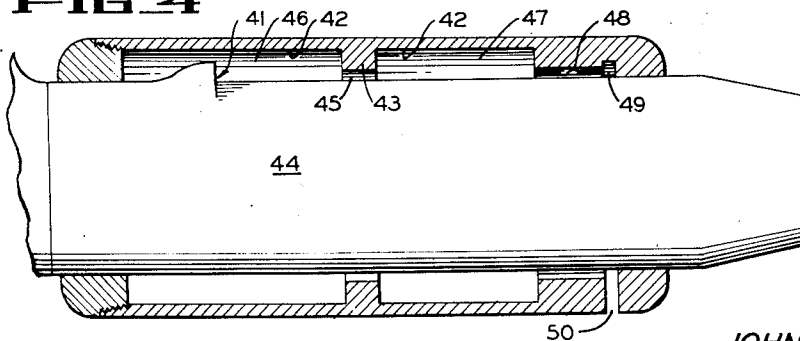


FIG. 4



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MUFFLER ATTACHMENT FOR AIR DRIVEN TOOLS OF THE IMPACT TYPE

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9 Claims. (Cl. 181—36)

My invention relates to improvements in air driven tools of the impact type and more particularly to means for muffling the exhaust of such tools during operation, which will, at the same time, facilitate the manual directing thereof.

Air tools of the impact type generally comprise a cylinder within which a piston is pneumatically movable in opposite directions; the piston serving as an exhaust valving member during its travel and also as an impact member as it strikes a chisel or the like at one end of its travel. The air exhaust, which is directed generally laterally of the cylinder, varies in force as various exhaust ports are opened and closed during the piston's travel and the intermittent sideward impulses thus produced create a highly objectional noise as well as make it difficult for an operator to maintain the working end of such a chisel or the like at the proper location on the work.

In order to muffle the air exhaust of such an air tool, it has heretofore been proposed to provide such air tools with a chamber having staggered internal baffles by which the impulses of the air exhaust are damped; an example of an impact tool of this type being illustrated in the Fuehrer Patent No. 2,128,742.

Impact tools of the above type have not, however, proved particularly satisfactory for the reason that the muffling effect provided by such expansion chambers has not satisfactorily reduced the noise level of the air exhaust, and such tools have remained objectionable both to the user and to other persons in the vicinity or area where the tool is being used.

By employment of the present invention, I have found that the noise of the air exhaust can be substantially reduced and the tool so silenced as to be unobjectionable by providing a muffling and exhaust dampening device of improved type in which the air exhaust discharged through exhaust ports in the tool casing is caused to flow through an expansion chamber surrounding the tool casing after which it is exhausted to atmosphere through an air exhaust means which, in accordance with a principal feature of my invention, is (1) adapted to restrict the flow of air through the pneumatic tool and (2) is so arranged and disposed with respect to the expansion chamber that at least a portion of the path of the discharged air flowing through the same will be angular with respect to the direction of flow of the discharged air impulses entering the expansion chamber.

In accordance with the foregoing, the present invention contemplates the provision of a muffling and exhaust dampening means which may be either constructed in the body of the tool as an integral part thereof or may be supplied as an attachment for existing tools. In this respect, my invention specifically contemplates the provision of a muffling and exhaust dampening means for use in or with an impact type air tool having a casing, a piston reciprocal within the piston chamber, and an air discharge means or port in the casing communicating with the piston chamber; such muffling and exhaust

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dampening means including an expansion chamber surrounding the casing and adapted to receive the air impulses discharged through the air discharge means or port therein, and an air exhaust means adapted to exhaust the discharged air from the expansion chamber including an air passage communicating with the expansion chamber adapted to build up slight, but only slight, pressure within the expansion chamber, and an exhaust port communicating with the air passage and angularly disposed with respect thereto.

The above, as well as other novel features of the muffling and exhaust dampening means according to my invention will be more readily understood from the following description of the accompanying drawings illustrating the invention in accordance with one of its preferred embodiments, in which drawings:

Figure 1 is a side view of a device constructed according to my invention (showing a portion of the device and air tool in section), and which device is of the type adapted to be used as an attachment with an air driven impact tool of the kind shown;

Figure 2 is a perspective view of a modified embodiment of the attachment, as removed from the tool, and as would be viewed along line 2—2 of Figure 1;

Figure 3 is a fragmentary cross-sectional view of the modified embodiment of the invention shown in Figure 2 and as would be viewed along line 3—3 of Figure 1; and

Figure 4 is a side view of a modified embodiment of a muffler constructed according to the present invention.

Referring to the drawings, the invention as presently illustrated is shown as applied to a pneumatic impact tool, generally designated as 10, of conventional type having a casing or cylinder 11 to which is secured a handle 12. Within the handle 12 there is incorporated a throttle valve (not shown) operated by a throttle handle or lever 13. Reciprocally mounted within the piston chamber 14 of the casing 11, there is the usual piston 15 which is responsive to the action of fluid pressure admitted into the piston chamber 14 through passages 16 and 17, respectively. The selective admission of the pressure fluid into the passages 16 and 17 may be controlled in any suitable and well known manner, as for example, by means of a valve mechanism (not shown) arranged between the piston chamber 14 and the handle 12 in which a distributing valve is adapted to oscillate in a valve chamber in communication with the passages 16 and 17. Exhaust ports 18 and 19 are provided in communication with the piston chamber 14, which serve in response to the valving action of the piston 15 to discharge the fluid pressure from the piston chamber 14 through the air passage 20 and the discharge port 21.

A working implement 22, here shown as a chisel, is carried in the end of the cylinder 11 by means of a bushing 23, with the rearward end of the chisel 22 projecting into the forward end of the piston chamber 14 to receive the forward blows of impact of the piston 15.

In pneumatic impact tools of the foregoing type an exhaust deflector is usually provided for defusing the pressure fluid exhausted through the discharge port 21 in order to prevent the direct flow of such impulses of pressure fluid to the atmosphere. To this end, and by way of example, a sleeve 24 is generally disposed about the tool to form an exhaust chamber 25 around the cylinder 11 adjacent to the discharge port 21. The sleeve 24 is split longitudinally from one end to the other, as at 26, to provide an escape for the pressure fluid from the chamber 25 and to diffuse, by permitting the pressure fluid to escape along the entire length of the split 26, such pressure fluid during its passage from the chamber 25 to the atmosphere.

Referring now to the exhaust dampening and muffling

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attachment which, according to the preferred embodiment of the present invention illustrated in Figures 1, 2 and 3 of the drawings, is adapted to be used with a pneumatic tool of the type above described, such attachment comprises a cylindrical member, generally designated as 39, which is adapted to be carried by the tool and to surround the cylinder 11 and sleeve 24, extending as shown on either side of the discharge slot 26. The interior of the cylindrical member 30 is cut away intermediate its end portions to provide a tubular portion 32 which cooperates with the outer circumference of the tool casing 11 and sleeve 24 to define an expansion chamber 33 for the reception of the impulses of the exhaust fluid discharged from the piston chamber 14 of the tool through the discharge port 21, thence through the slot 26. As shown, the shoulder portions 35 and 36 are of such diameter as to engage outer circumferential portions of the casing 11 in substantially sealing engagement and, for ease of manufacture and convenience of assembly of attachment on the tool, the shoulder portion 35 may comprise a separate annular ring which, when the attachment is properly assembled on the tool, is secured in the manner shown in sealed engagement with an end portion of the intermediate sleeve portion 32 by means of one or more set screws 37.

An intermediate circumference of the shoulder portion 36 adjacent to the expansion chamber 33 is cut away to provide a longitudinally extending circumferential air passage 38 (Figure 1) which communicates with an annular groove or manifold 39. The cross-sectional area of the air passage 38 should be such as to restrict slightly the flow of the pressure fluid through the tool but not sufficient to cause back pressure sufficient to appreciably decrease the power factor of the tool. Alternatively, as shown in Figures 2 and 3, the circumferential shoulder portion adjacent to the expansion chamber 33 may more closely engage the adjacent circumferential portion of the tool casing 11, in which case a plurality of longitudinally extending grooves 38a are provided between the expansion chamber 33 and the manifold groove 39, the total of the cross-sectional areas of the grooves 38a being equal to the cross-sectional area of the above-described air passage 38. Communicating with the manifold groove 39 is a radially extending peripheral slot 40 which, as shown in Figure 3, extends approximately one-third the way around the circumference of the cylinder 30 and is of larger cross-sectional area than that of the air passage 38 or longitudinal grooves 38a.

In Figure 4 of the drawings, there is shown a modified embodiment of an exhaust dampening and muffling attachment constructed in accordance with my invention, particularly adapted for use with pneumatic impact tools of the heavy duty type in which large quantities of air under high pressures are employed. In tools of this type, the fluid pressure is generally discharged in a forward direction through a relatively large air discharge port, as indicated at 41, and in order to effect a substantial dampening and muffling of the exhaust of a tool of this type the intermediate sleeve portion 42 is formed with a shoulder portion 43 which loosely surrounds the tool casing 44 and cooperates therewith to define a longitudinally extending circumferential air passage 45 which has sufficient cross-sectional area as not to restrict the flow of the pressure fluid through the tool. As will be observed, the shoulder portion 43 serves to divide the expansion chamber into a first expansion chamber 46, which is arranged to receive the exhaust impulses discharged through the discharge port 41, and a second expansion chamber 47 adapted to receive in series the discharged air exhaust therefrom and in turn to discharge the same through the restricting, longitudinally extending circumferential air passage 48 to the annular groove or manifold 49 where it is exhausted to atmosphere through the radially extending slot or exhaust port 50, all in the manner described hereinbefore.

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In practice, I have found that when my invention is applied to pneumatic tools of the impact type, the sound vibrations caused by the intermittent impulses of the exhaust fluid discharged from the piston chamber will be so silenced as to be unobjectionable; and that the intermittent impulses of the exhaust fluid will be so dampened that they issue in a substantially constant and even stream such that the operator of the tool can easily maintain the working end of the tool implement, for example, a chisel or the like, at the proper location on the work. Moreover, while the invention has been specifically illustrated and described with respect to two preferred embodiments thereof of the type adapted to be used as an attachment with respect to an air driven impact type tool of the type described, it is obvious that my invention may be readily adapted for use with other impact type tools and that the novel features of the invention may, if desired, be readily incorporated as an integral part of the tool in a simple and economical manner.

What is claimed is:

1. In pneumatic tools of the type described having a casing, a piston chamber within the casing, an air actuated piston reciprocable within said piston chamber, and air discharge means in said casing communicating with said piston chamber: means for muffling and dampening the air impulses discharged from said piston chamber through said air discharge means comprising an expansion chamber surrounding said casing and adapted to receive the air impulses discharged through said air discharge means, and air exhaust means communicating with said expansion chamber to exhaust to atmosphere the discharged air therefrom, said air exhaust means including a longitudinally disposed circumferential air-passage means communicating with said expansion chamber and an air exhaust port communicating with said circumferential air-passage means and so disposed with respect thereto that the path of the discharged air exhausted to atmosphere through the said air exhaust port will be angular to the longitudinal path of the discharged air flowing through the said circumferential air-passage means from the expansion chamber, to cause said discharged air impulses to be damped and muffled in said expansion chamber and exhausted therefrom as a substantially steady stream.

2. A muffling and dampening means according to claim 1 wherein the expansion chamber includes a first expansion chamber surrounding the casing, and adapted to receive the air impulses discharged from the piston chamber through the air discharge means, and a second expansion chamber surrounding the casing and adapted to receive in series the discharged air from said first expansion chamber and to exhaust the same through the said air exhaust means.

3. A muffling and dampening device for use with pneumatic tools of the type described including a cylindrical casing, a piston chamber within said casing, an air actuated piston reciprocable within the piston chamber, and air discharge means in said casing communicating with said piston chamber said device comprising a hollow cylindrical body adapted to be carried by the tool in surrounding relation with respect to at least a portion of said casing, and including an intermediate sleeve portion larger than the casing and adapted to surround said casing and air discharge means in spaced relation with respect thereto, shoulder portions at each end adapted to engage the said casing substantially in sealed relation, said shoulder portions and intermediate sleeve portion cooperating with said casing to define an expansion chamber adapted to receive the air impulses discharged through the air discharge means, and air exhaust means in one of said shoulder portions arranged to exhaust to atmosphere the discharged air from said expansion chamber including a longitudinally disposed circumferential air-passage means communicating with said expansion chamber and an air

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exhaust port communicating with said circumferential air-passage means and so disposed with respect thereto that the path of the discharged air exhausted to atmosphere through the said air exhaust port will be angular to the longitudinal path of the discharged air flowing through the said circumferential air-passage means from the expansion chamber, to cause said discharged air impulses to be damped and muffled in said expansion chamber and exhausted therefrom in a substantially steady stream.

4. The device according to claim 3 wherein the longitudinally disposed circumferential air-passage means is adapted to restrict the flow of discharged air through the pneumatic tool, and the passage of the air exhaust port communicating with said restricting air passage is so disposed that the path of the discharged air exhausted through said exhaust port will be at an angle of approximately 90° to the flow of discharged air through the said restricting air passage.

5. The device according to claim 4 wherein the restricting air passage means is provided by a portion of the shoulder adjacent the expansion chamber being loosely spaced with respect to the tool casing, and the exhaust port is radially disposed in said shoulder in communication with longitudinally disposed restricting air passage so defined by the loosely spaced shoulder portion and the tool casing.

6. The device according to claim 4 wherein the restricting air passage means is provided by a plurality of longitudinally disposed grooves formed in the shoulder in communication with the expansion chamber, the exhaust

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port is provided by a radial slot disposed around a portion of the circumference of the shoulder, and an annular groove is provided on the inner circumference of the shoulder in communication with said grooves and said slot.

7. The device according to claim 3 wherein the intermediate sleeve portion is provided with a shoulder portion adapted to loosely surround the casing and so disposed as to divide the said expansion chamber into a first expansion chamber arranged to receive the air impulses discharged from the piston chamber through the air discharge means, and a second expansion chamber adapted to receive in series the discharged air from said first expansion chamber and to exhaust the same through the said restricting air passage and exhaust port, respectively.

8. The muffler according to claim 1 wherein the circumferential air passage means will restrict the flow of discharged air through the pneumatic tool.

9. The muffler according to claim 1 wherein the passage of the air exhaust port is disposed at an angle of approximately 90° to the passage provided by the circumferential air-passage means.

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