

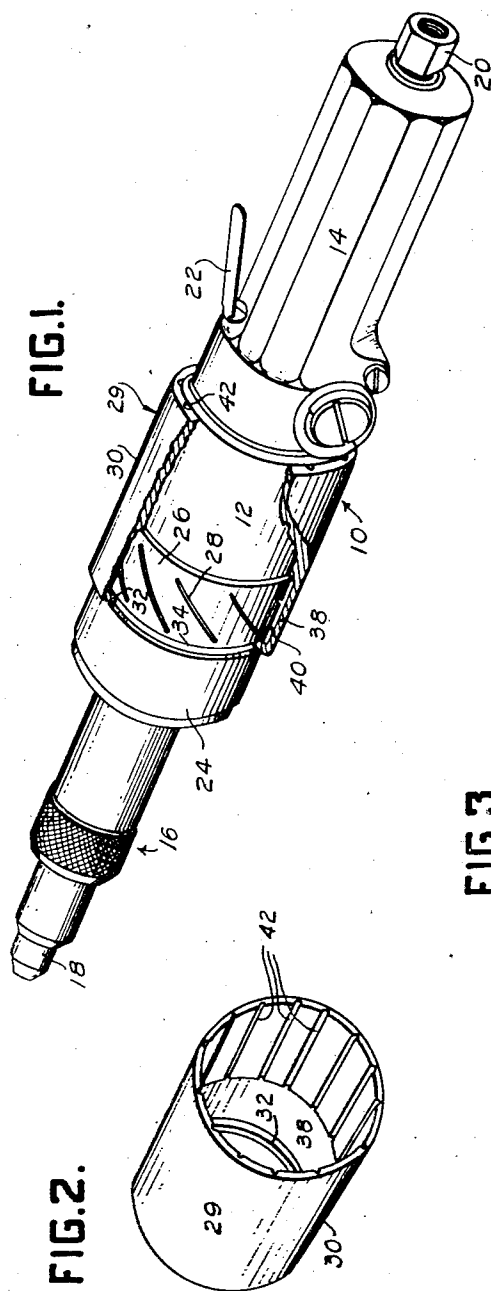
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ACOUSTICAL WAVE FILTER FOR PNEUMATIC HAND TOOLS

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ACOUSTICAL WAVE FILTER FOR
PNEUMATIC HAND TOOLS

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1 Claim. (Cl. 181-48)

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The improved wave filter comprising the present invention is primarily adapted for use in connection with pneumatic tools of the small portable or hand variety having substantially cylindrical or, at least, tubular casings, the axis of which coincides with or is parallel to the axis of rotation of the tool rotor enclosed within the casing.

Portable tools of the type briefly outlined above consist of a generally cylindrical casing within which is housed the rotor. Compressed air is admitted into one end of the casing and, after performing useful work in driving the rotor, it is expelled through a series of slots or exhaust ports which are arranged in circumferentially spaced relationship around the body of the casing in the medial regions of the latter. These slots, in certain types of pneumatic tools, extend axially along the casing, while in other types they are of spiral configuration, i. e., a center line drawn along the axis of any one of the slots will be in the form of a helix section having a shape and pitch that is determined according to proper engineering exigencies in conformity with the size and shape of the operative rotor elements to insure maximum release of air and a minimum of back pressure.

Experience has shown that tools of this type possess one limitation in that the rotor coats with the exhaust ports to produce a siren effect consisting of more or less sinusoidal sound waves which combine to produce a note, the pitch of which varies with the rate of rotation of the rotor and which, with small portable tools such as screw drivers, hand drills and the like, is sufficiently far up in the range of audible frequencies to produce a shrill and objectionable whistle.

The present invention is designed to overcome the above noted limitation that is present in connection with portable hand tools of this type and, accordingly, it is an object of the invention to suppress an objectionable band of frequencies while permitting a large flow of air, thus reducing counter pressure.

Another object of the invention, in pneumatic tools of this character, is to provide a wave filter or muffler which is readily attachable to and removable from the assembled pneumatic tool and which, when assembled thereon, affords a compact muffled tool assembly, the transverse width or diameter of which is not materially increased.

Other objects and advantages of the invention not at this time enumerated will become readily apparent as the following description ensues.

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In the accompanying single sheet of drawing forming part of this specification two embodiments of the invention have been shown. In this drawing:

Fig. 1 is a perspective view, partly in section, of one form of the improved wave filter showing the same operatively applied to a pneumatic tool having spiral exhaust ports.

Fig. 2 is a perspective view of the filter shown in Fig. 1 showing the same detached.

Fig. 3 is a fragmentary side elevational view, partly in section, of another form of the wave filter showing the same applied to a pneumatic tool having axially extending exhaust ports.

Referring now to the drawing in detail, a pneumatic hand tool assembly is designated in its entirety at 10 and includes a rotor casing 12 which is preferably formed of a light-weight metal, such as aluminum, a handle 14 also formed of aluminum, and a chuck assembly 15 including a chuck proper 18 designed to receive therein a suitable bit, as for example, a screw driver, drill or the like, (not shown).

The tool assembly 10 is designed for attachment to a supply hose (not shown) for supplying compressed air to the interior of the casing 12 and, toward this end, it is provided with a nipple 20 for attachment purposes.

The handle 14 has associated therewith a manually operable valve lever 22 for admitting motive fluid, i. e., compressed air, to the interior of the casing 12 to drive the rotor and, consequently, the chuck 18 and bit carried thereby.

The chuck assembly 16 is detachable from the casing 12 and, accordingly, the forward end thereof is exteriorly threaded and is adapted to receive thereover the interiorly threaded end of the assembly 16 which is shown as being enlarged as at 24.

The rotor casing 12 is formed with an enlarged band-like portion 26 in which there are formed a series of circumferentially spaced exhaust ports in the form of elongated slots 28. These slots or exhaust ports 28 are, in the form of the invention under discussion, of spiral configuration, i. e., a center-line passing medially and axially therealong will be in the form of a helix section having a shape and pitch which is determined according to the character of the rotor in order that a minimum obstruction to the passage of air from the casing 12 will be attained.

The arrangement of parts thus far described are purely conventional in their design and no claim is made herein to any novelty associated with the same, the novelty of this application

residing in the construction, combination and arrangement of parts now to be pointed out in detail.

The improved acoustical wave filter 29, as shown in Figs. 1 and 2, comprises a substantially cylindrical apron 30 of a length substantially equal to the length of the cylindrical casing 12 and having an inwardly extending or internal attachment flange 32 formed at one end thereof. The flange 32 is adapted to fit snugly around the forward end of the casing 12 and is designed to be clamped between a shoulder 34 afforded by the edge of the enlarged band-like portion 26 and the circular rear edge of the chuck assembly 16.

The internal diameter of the apron 30 is slightly greater than the external diameter of the casing 12 and the parts are machined and polished in such a manner that a clearance of approximately .001 inch is maintained between the outer and inner surfaces of the casing and apron respectively.

The apron 30 is formed with a wide internal grooved portion 33, the width of which is slightly greater than the width of the band-like enlarged portion 26 of the casing 12 and this grooved portion is of such depth that a substantial clearance between the surface of the enlarged portion 26 and the internal surface of the groove is provided affording an annular air chamber 40 which surrounds the region of the outlet slots 28. A small clearance of approximately .001 inch exists between the rear side wall of the groove 33 and the edge of the enlarged band-like portion 26 for a purpose that will be made clear presently.

A plurality of grooves 42 are formed internally of the apron 30 and extend in parallelism in an axial direction. These grooves 42 are equally circumferentially spaced about the interior of the apron and are of a depth sufficiently great to allow an appreciable amount of air to escape there-through from the chamber 40 to the atmosphere.

The exact dimensions of the pneumatic tool and of the wave filter therefor have not been specified herein although a clearance of approximately .001 inch has been suggested for the width of the space existing between the respective exterior and interior surfaces of the same, and also for the clearance between the edge of the enlarged portion 26 and side of the groove 33. This dimension is critical only insofar as it affords a substantial seal between the parts excluding the passage of air and thus confining the exhaust of the tool to the chamber 40 and passages afforded by the grooves 42.

From the above description it will be seen that the improved wave filter or muffler is a stationary or fixed structure on the body of the assembled tool but is removable therefrom when the tool is disassembled.

The two sections of the filter, namely, the expansion chamber section 38 and the section including the longitudinally extending grooves 42, in combination, afford the desired filtering action. The section 38 affords a header space which, in combination with the longitudinally extending grooves 42, constitute a resonant filter of high frequency. In the absence of the filter, air issues from the outlet ports 28 in the form of successive puffs having a frequency which is within the audible range. However, when the filter is provided such puffs of air enter the header space and are only able to escape therefrom through the longitudinal grooves 42 in puffs having a frequency conforming to the natural period of the muffler cavity. This latter frequency is

not above the audible range but it is so high that the sound waves of this frequency are heard simply as a prolonged hissing sound.

In the form of the invention shown in Fig. 3, the rotor casing 12' of the tool 10' has integrally formed thereon a shoulder 34' and a threaded portion 35', the latter being provided for the purpose of receiving thereon the interiorly threaded end 32' of a modified form of wave filter 29'. The rotor casing 12' of the tool 10', unlike the tool 10 in the other form of the invention, is provided with a substantially smooth uniform outer surface and the internal groove 38' affords an expansion chamber 40' which is similar in its function to the chamber 40. The inner surface of the apron 30' and the outer surface of the casing 12' are polished to maintain an approximate .001 inch clearance for reasons previously set forth in connection with the other form of the invention.

The slots or outlet ports 28' are relatively short and have their axes arranged in parallelism with the axis of the tool rotor and of the body of the tool.

The principle of operation of this form of the invention is substantially the same as in the form of the invention shown in Figs. 1 and 2.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the apparatus illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claim.

What is claimed is:

The combination with a pneumatic tool having a substantially cylindrical rotor casing provided with a series of circumferentially spaced exhaust ports therein in the form of elongated helical slots arranged in parallelism, the circumferential component of extent of said helical slots being such that the slots overlap each other, of a wave filter therefor comprising an apron, means for attaching said apron to said casing in fixed relationship thereto, there being a circumferential groove formed internally of said apron in register with all of said exhaust ports and providing in combination with the external surface of the casing an annular expansion chamber, the internal diameter of said apron exclusive of said groove being slightly in excess of the external diameter of the casing and affording a clearance not substantially greater than .001 inch, there being a series of parallel grooves formed internally of the apron and extending in a direction substantially parallel to the axis of said rotor casing and serving to establish communication between said expansion chamber and the atmosphere.

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