FIG. 1-

FIG. 2-

FIG. 3-

FIG. 4-

INVENTORS:
Ronald M. Miller
Richard A. Rudnicki

ATTY.
3,404,749  

CHAIN SAW MUFFLER  

Ronald M. Miller and Richard A. Rudnicki, Toledo, Ohio, assignors to American-Lincoln Corporation, Toledo, Ohio, a corporation of Ohio  
Filed Mar. 27, 1967, Ser. No. 625,990  
5 Claims. (Cl. 181—40)  

ABSTRACT OF THE DISCLOSURE  

The invention relates to a muffler for chain saws, which muffler is of small size, produces low back-pressure, and has an effective muffling ability. The muffler includes several exhaust outlets in the form of exhaust tubes in the casing, which tubes are directed downwardly. A baffle also is employed in the muffler between the inlet and the exhaust tubes.  

This invention relates to a muffler and particularly to a muffler for a chain saw.  

Effective chain saw mufflers are difficult to achieve particularly because of size limitations of such mufflers. Especially with the newer, small, light-weight chain saws, the mufflers employed therefor are even more limited in size than with the larger chain saws. With any chain saw, however, the muffler must be compact and often of specific shape to fit properly with the chain saw engine, housing, and other components. Further, chain saw power units are usually two-cycle, high-speed engines which tend to be noisier than other engines. These factors render the design of an effective chain saw muffler extremely difficult.  

Chain saw mufflers have two conflicting characteristics: noise reduction and back pressure. A muffler designed to reduce the noise level of a chain saw engine to a particular decibel rating often will produce an objectionable back pressure which seriously decreases the power of the engine and reduces the cutting speed of the chain. Similarly, a muffler which establishes low back pressure and produces a minimum reduction in cutting speed, will lack sufficient muffling ability so that the noise level of the engine will be objectionable.  

The present invention provides a new chain saw muffler having unique features which result in a back pressure which does not cause a serious decrease in engine power and cutting speed and, at the same time, reduces the noise level of the engine to a desirable rating. To achieve this, the new muffler is uniquely designed and incorporates several exhaust tubes in the muffler housing, which tubes direct the exhaust downwardly. The muffler also has a specially designed baffle arranged between the exhaust gas inlet of the muffler and the exhaust tubes, which further enhances the muffling characteristics of the muffler without unduly increasing back pressure. It is, therefore, a principal object of the invention to provide a chain saw muffler which is capable of reducing the noise level of the chain saw engine to a reasonable amount and without unduly increasing the back pressure. Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawing, in which:  

FIG. 1 is a view in perspective of a chain saw having a muffler in accordance with the invention;  
FIG. 2 is an enlarged, fragmentary view in cross section, taken along the line 2—2 of FIG. 1;  
FIG. 3 is an exploded view in perspective of the muffler of FIG. 2; and  
FIG. 4 is a view in vertical cross section taken along the line 4—4 of FIG. 2.  

Referring to FIG. 1, a chain saw indicated at 10 can be of substantially conventional design and will not be discussed in detail. The chain saw includes an engine 12 having an engine block 14 (FIG. 2) forming an exhaust port 16.  

A muffler 18 is affixed to the engine block 14 around the opening 16 and, in turn, has exhaust gas outlets directed downwardly therefrom. The muffler 18 includes a first part 20 forming a first exhaust gas chamber 22. The part 20 has a mounting plate 24 forming an exhaust gas inlet opening 26. Bolts 28 extend through openings 30 in end portions of the mounting plate and are turned into the engine block 14 at appropriate positions to bring into registry the exhaust port 16 and the exhaust gas inlet opening 26. As shown, the first part 20 also forms a neck 32 extending beyond the main portion of the chamber 22, with the neck preferably being located at one side of the chamber, as shown.  

The muffler 18 also includes a second part 34 forming a baffle 36 with a peripheral flange 38 extending therearound. The baffle 36 preferably includes an imperforate section 40 located generally in line with the exhaust gas inlet opening 26 and a perforated portion 42 which extends over about two-thirds of the area of the baffle 36. As shown, the perforated portion 42 includes several vertical rows of openings, including elongate openings 44 and circular openings 46, except for the last row which contains only the circular openings 46.  

The muffler 18 further includes a third part 48 forming a second exhaust chamber 50. The third part includes an enlarged portion 52 and a smaller portion 54 forming a shoulder 56 therebetween. The shoulder 56 aids in maintaining the baffle 34 in position when the third part 48 is assembled with the first part 20 by the enlarged portion 52 flaring over the edge of the part 20. The enlarged portion 52 has tongues 54 through which screws or other suitable fasteners 56 extend into openings 58 in the first part 20.  

A lower edge wall 60 of the smaller portion 54 of the part 48 has three openings 62, 64, and 66 therein which form exhaust gas outlets for the muffler. Exhaust gas outlet tubes 68, 70, and 72 are fastened to the lower edge wall 60 at the openings 62, 64, and 66 and extend inwardly from the wall 60. As shown, the tubes 68, 70, and 72 can have annular shoulders 74 thereon which aid in mounting the tubes on the wall, the tubes being suitably fastened, as by being brazed. As shown, the tubes 68, 70, and 72 are located perpendicularly to the portion of the wall 60 from which they extend, although this is not essential. The size of the tubes does play an important part, however, in the effectiveness of the muffler. As shown, the tubes are of uniform size and shape, with the lengths being about 1.5 times their diameters. In a typical example, the tubes are 0.76—0.78 inch long with an inner diameter of 0.42—0.45 inch. It has been found that the length to inner diameter ratio can vary from approximately 1 to 1 to approximately 2 to 1 with reasonable muffling characteristics achieved, although a ratio of from 1.4 to 1 to about 1.6 to 1 is preferred. As the ratio decreases below the minimum, the noise level of the engine becomes excessive whereas, when the ratio is increased above the maximum, the back pressure in the muffler becomes excessive with the cutting speed of the chain saw consequently being decreased excessively.  

The total area of the openings 44 and 46 in the baffle 36 also affects the muffling characteristics. Preferably, the area of the openings is from about one-fourth to two-thirds the area of the baffle, with larger open areas increasing the noise level excessively and with smaller open areas increasing the back pressure excessively. If it is preferred that the imperforate portion 40 is located between the exhaust inlet opening and the exhaust outlet openings. Also, in the preferred form, the area of the
baffle openings 44 and 46 should be from approximately 1.1 to 2.0 times the area of the inner passages of the exhaust tubes 68, 70, and 72.

Various modifications of the above described embodiment of the invention will be apparent to those skilled in the art, and it is to be understood that such modifications can be made without departing from the scope of the invention, if they are within the spirit and the tenor of the accompanying claims.

We claim:

1. A muffler according to claim 4 wherein said perforate portion constitutes about two-thirds the area of the baffle.

2. A muffler according to claim 4 wherein the open area of said perforate portion is from one-fourth to two-thirds the area of the baffle.

3. A muffler according to claim 4 wherein the area of the baffle openings is from approximately 1.1 to 2.0 times the area of the passages in the exhaust tubes.

4. A chain saw muffler comprising wall means forming a portion of a first chamber and a neck extending therefrom near an edge portion of said first chamber, said neck having means for connecting an exhaust gas inlet opening of said neck with an exhaust gas port of the chain saw engine, a baffle extending transversely to and spaced from said neck, said baffle completing said first chamber, said baffle having an imperforate portion near an edge portion thereof aligned with said neck and having an adjacent perforate portion transversely spaced from said neck, said muffler further having wall means on the side of said baffle opposite said first chamber and forming a second chamber with said baffle on the side of said baffle opposite said first chamber, and at least one exhaust gas tube extending into said second chamber only from an opening in a lower wall portion of said second chamber for exhausting exhaust gases from said second chamber only in a downward direction.

5. A chain saw muffler construction comprising a first part defining a portion of a first chamber and a neck extending therefrom, said neck having an exhaust gas inlet opening therein, said part adjacent said opening having means to receive fasteners for attaching said part to the chain saw engine with said neck opening communicating with an exhaust gas port of the engine, a second part forming a baffle extending transversely to and spaced from said neck and completing said first chamber, said baffle having an outer peripheral shape equal to that of said first part to meet with the outer edge of said first part, said baffle further having an imperforate portion aligned with said neck and having an adjacent perforate portion transversely spaced from said neck, a third part positioned primarily on the side of said baffle opposite said first chamber and forming a second chamber with said baffle, said third part having a small portion and an enlarged portion with a shoulder therebetween, said enlarged portion fitting over said second part and over a portion of said first part to hold said baffle in position, means connecting said first part and said third part, and exhaust gas means extending into said second chamber only from an exhaust gas opening in a lower wall portion of said second chamber for exhausting exhaust gases from said second chamber through said exhaust gas opening in a downward direction.

References Cited

UNITED STATES PATENTS
794,926 7/1905 Crawford 181—60 XR
2,353,036 7/1944 Hoyle 181—40
3,106,985 10/1963 Recupito 181—65

FOREIGN PATENTS
469,160 7/1937 Great Britain.
521,898 6/1940 Great Britain.

ROBERT S. WARD, JR., Primary Examiner.