May 16, 1961 A. L. KLEINECKE 2,984,315

EXHAUST FILTER-MUFFLER

Filed July 2, 1959

Fig. 1.

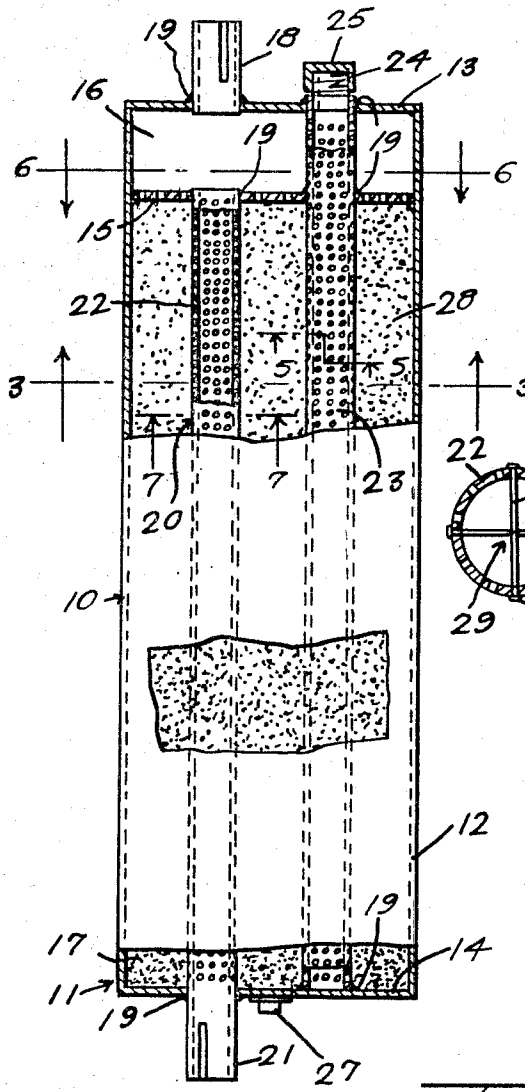


Fig. 2.

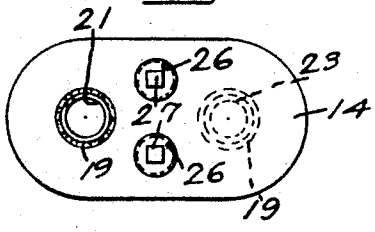


Fig. 3.

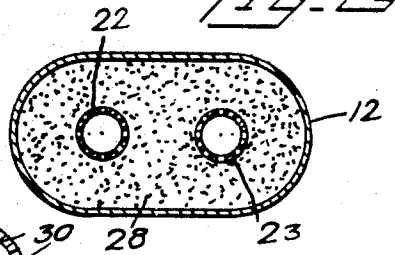


Fig. 7.

Fig. 4.

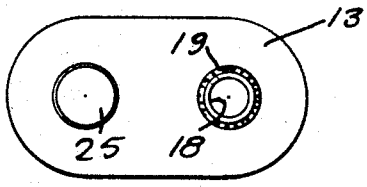


Fig. 5.

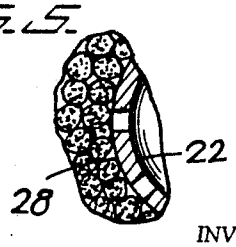
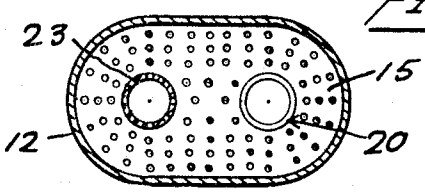


Fig. 6.



INVENTOR

A. L. KLEINECKE

BY John N. Randolph

ATTORNEY

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EXHAUST FILTER-MUFFLER

Albert L. Kleinecke, 1787 S. Vasco Road, Livermore, Calif.

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3 Claims. (Cl. 183—4.5)

This invention relates to an improved muffler for internal-combustion engines, primarily for motor vehicle engines, and has for a primary object to provide a muffler which will effectively function to absorb undesirable components in the exhaust gases passing therethrough between an exhaust manifold of an engine and the tail pipe to prevent such gases and smoke escaping to the atmosphere.

Another object of the invention is to provide a muffler which will function to effectively muffle noises and sounds accompanying the passing of the exhaust stream.

A further object of the invention is to provide a muffler equipped with a unique filter packing capable of effectively absorbing exhaust gases, fumes and smoke and having means whereby said packing may be reactivated or renewed without removal of the muffler from its mounting between the exhaust manifold outlet and the tail pipe.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a plan view, partly broken away and partly in horizontal section of the muffler;

Figure 2 is an end elevational view looking toward the outlet end of the muffler, or toward the lower end of Figure 1;

Figure 3 is a cross sectional view of the muffler, taken substantially along a plane as indicated by the line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 2 but looking toward the forward or inlet end of the muffler;

Figure 5 is an enlarged fragmentary detailed view in cross section, taken substantially along a plane as indicated by the line 5—5 of Figure 1;

Figure 6 is a cross sectional view through the muffler, taken substantially along a plane as indicated by the line 6—6 of Figure 1, and

Figure 7 is an enlarged cross sectional view in detail, taken substantially along a plane as indicated by the line 7—7 of Figure 1.

Referring more specifically to the drawing, the filter-muffler in its entirety is designated generally **10** and includes an elongated muffler casing **11** having a tubular wall **12** and end walls **13** and **14**. The muffler casing **11** is preferably cylindroidal in cross section, as seen in Figures 2, 3, 4 and 6, and with the horizontal width thereof being preferably about twice the vertical depth or thickness of the muffler, so that the muffler can be readily utilized with modern motor vehicles having small diameter wheels and a restricted road clearance.

The muffler casing **11** is provided with a transverse perforated partition wall **15** which is located substantially nearer the forward end wall **13** than the rear end wall **14** and which divides the muffler casing into a restricted forward chamber **16**, disposed between the walls **13** and **15**, and a substantially longer rear chamber **17**, disposed between the walls **15** and **14**. An inlet nipple or pipe **18** is mounted in the front wall **13** and extends forwardly therefrom. The nipple or pipe **18** may be secured as by

welding, as seen at **19**, to the wall **13** and extends through said wall so as to open into the forward chamber **16**. A pipe or tube, designated generally **20**, extends from end-to-end through the chamber **17** and has a forward end extending through the partition wall **15** and secured therein and opening into the chamber **16**. The opposite end of the tube **20** extends through the rear end wall **14** and a short distance therebeyond, and the portion thereof disposed externally of the end wall **14** constitutes the outlet nipple **21** of the muffler **10**. The pipe or tube **20** may be secured to the walls **14** and **15** by additional welds **19**. The portion of the pipe or tube **20**, extending between the walls **14** and **15** and disposed within the chamber **17**, is perforated, as seen at **22**. The tube **20** is preferably disposed in alignment with the inlet nipple **18** and laterally offset from the longitudinal center of the casing **11**, as seen in Figures 2, 3 and 6.

A perforated pipe or tube **23** has one end disposed against the inner side of the rear end wall **14** and closed thereby, and extends therefrom through the chambers **17** and **16** and through the partition wall **15** and front wall **13**. The pipe **23** is likewise secured to the walls **13**, **14** and **15** by additional welds **19**. An externally threaded nipple **24** is suitably secured in and projects from the open forward end of the pipe **23** and from the front wall **13** and is normally closed and sealed by an internally threaded cap **25**. The tube **23** is laterally spaced from the tube **20**; said tubes being disposed on opposite sides of the longitudinal center of the casing **11** and spaced from the casing wall **12**, as best seen in Figure 3.

The rear end wall **14**, preferably between the tubes **20** and **23**, is provided with two threaded access openings **26** which are normally closed and sealed by threaded plugs **27**. The access openings **26** are provided for filling the chamber **17** with a filter packing **28** formed of small particles or nodules of activated wood charcoal which are somewhat larger than the perforations of the wall **15**, tube portion **22** and tube **23** and which completely fill the chamber **17** around the tube portion **22** and the part of the tube **23**, which extends through said chamber.

The wood charcoal nodules forming the packing **28** are activated by reheating of the wood charcoal at a very high temperature for a period of approximately eight hours, as a result of which the absorptive capacity of the charcoal is materially increased, and the absorptive capacity is even further enhanced by subjecting the charcoal to carbon dioxide or superheated steam, while impregnated with certain chemicals, such as zinc chloride, sulfuric acid or phosphoric acid, followed by exposure of the charcoal for a period of time to a high temperature. This activation of the wood charcoal augments the available surface of the charcoal nodules and produces a decrease in the bulk density and, consequently, a greatly increased porosity, enabling the packing **28** to readily absorb smoke and the harmful gases and fumes of an engine exhaust. In addition, the filter packing effectively functions to muffle the sounds and noises created by the exhaust stream. The packing **28** also absorbs any moisture carried by the exhaust to prevent rust or corrosion of the other muffler parts and to thereby materially increase the usable life of the muffler.

The tube portion **22** is provided with one or more diffusers **29**, one of which is shown in detail in Figure 7. The diffuser **29** comprises two heavy steel wires **30** each of which extends diametrically across the tube portion **22** through the wall thereof. The ends of the wires **30** may be welded or riveted to the exterior of the tube portion **22**, as seen at **31**.

The intake nipple **18** is connected, in a conventional manner, to the exhaust outlet, not shown, of the exhaust manifold of an internal-combustion engine, and the exhaust nipple **21** is likewise connected in a conventional

manner to the tail pipe, not shown. The engine exhaust, consisting of gases and vapor under pressure, discharges into the forward muffler chamber 16 from the intake nipple 18. A part of the exhaust will be forced through the perforated partition 15 into the packing 28, while another part thereof will enter the tube 23, through the perforated part thereof extending through the chamber 16, and will escape from the part of the tube 23, extending through the chamber 17, into the packing 28. The remainder and major part of the exhaust will enter the tube portion 22 directly from the chamber 16 and in passing longitudinally therethrough will be deflected into the charcoal packing 28, through the perforations of the tube portion 22, by the action of the diffusion unit or units 29 which agitate and create a turbulence in the gases flowing through the tube portion 22, without producing an undesirable restriction or back pressure, so that sufficient velocity of the flow stream in the tube portion 22 is maintained for carrying away the filtered exhaust which re-enters the tube portion 22 from the chamber 17, after passing through the packing 28, and which includes the portions of the exhaust which initially passes through the partition 15 and tube 23. Thus, substantially all of the exhaust will be filtered by the packing 28 before escaping through the outlet nipple 21.

The activated wood charcoal packing 28 can be regenerated or reactivated by removing the cap 25 and attaching the nozzle of a superheated steam line, not shown, to the nipple 24. The superheated steam thus supplied to the perforated tube 23 will escape therefrom into the chambers 16 and 17. A part of the steam entering the chamber 16 will pass through the perforated partition 15 into the packing 28 and the remainder will pass from the chamber 16 directly into the tube portion 22. The balance of the steam will escape from the tube 23 directly into the packing 28. All of the steam passing through the chamber 17 will enter the tube portion 22 and escape through the outlet nipple 21. The charcoal packing may also be chemically treated by applying chemicals thereto in the same manner that the packing is treated with the superheated steam. This regeneration of the packing 28 can be accomplished without removal of the muffler from an applied position and with the engine idling to maintain a pressure in the intake nipple 18 to prevent the steam or chemical from flowing therethrough to the engine.

The casing chamber 17 may be refilled with the charcoal nodules by removal of the plugs 27.

Substantially all parts of the muffler 10, with the exception of the packing 28 and closures 25 and 27, are formed of steel plate and tubing to provide a muffler construction of maximum durability.

Various modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. An exhaust filter-muffler comprising an elongated muffler casing including a tubular wall, a front wall and a rear wall, a perforated partition wall disposed adjacent said front wall and dividing the muffler casing into a front chamber and a substantially larger rear chamber, an intake nipple supported by and extending forwardly from the front wall and opening into the front chamber, a tube extending through said rear chamber and through the rear wall and partition wall and having a forward end opening into the forward chamber and a rear end extending outwardly from the rear wall and constituting the exhaust nipple of the muffler, the portion of said tube extending through the rear chamber being perforated, a second tube extending longitudinally of the casing through said chambers and through said front wall and partition wall and having a closed forward end and a rear end closed by said rear wall, said second tube being perforated from the rear wall to the front wall, and said rear chamber containing a filtering and noise absorbing packing surrounding the portions of the tubes extending through the rear chamber for filtering out exhaust gases passing through the muffler casing between the inlet nipple and outlet nipple.

2. An exhaust filter-muffler as in claim 1, said packing comprising a mass of activated charcoal nodules, said second tube having a nipple extending from its forward end, a removable closure detachably engaging the nipple and combining therewith to form said closed forward end, said nipple affording access for superheated steam or a chemical under pressure adapted to be supplied to said second tube, when the closure is removed, for regenerating and reactivating the activated charcoal packing.

3. An exhaust filter-muffler as in claim 1, said casing being of cylindrical shape in cross section and having a horizontal width substantially greater than the vertical width or depth thereof, said tubes being disposed in transversely spaced relation to one another within the casing, and said first mentioned tube being disposed in alignment with the inlet nipple.

References Cited in the file of this patent

UNITED STATES PATENTS

37,500	Fontain	Jan. 27, 1863
758,402	Yackel	Apr. 26, 1904
1,811,762	Schnell	June 23, 1931
1,844,034	Duber	Feb. 9, 1932
2,041,767	Jack	May 26, 1936
2,059,487	Peik	Nov. 3, 1936
2,077,563	Henry	Apr. 20, 1937
2,420,789	Mobley	May 20, 1947
2,560,152	Berl	July 10, 1951
2,789,032	Bagley et al.	Apr. 16, 1957
2,824,619	Bremer et al.	Feb. 25, 1958
2,924,293	Sprague	Feb. 9, 1960