Aug. 15, 1939 F. NEWTON 2,169,658

SILENCER FOR EXPLOSIVE ENGINES

Filed June 7, 1938

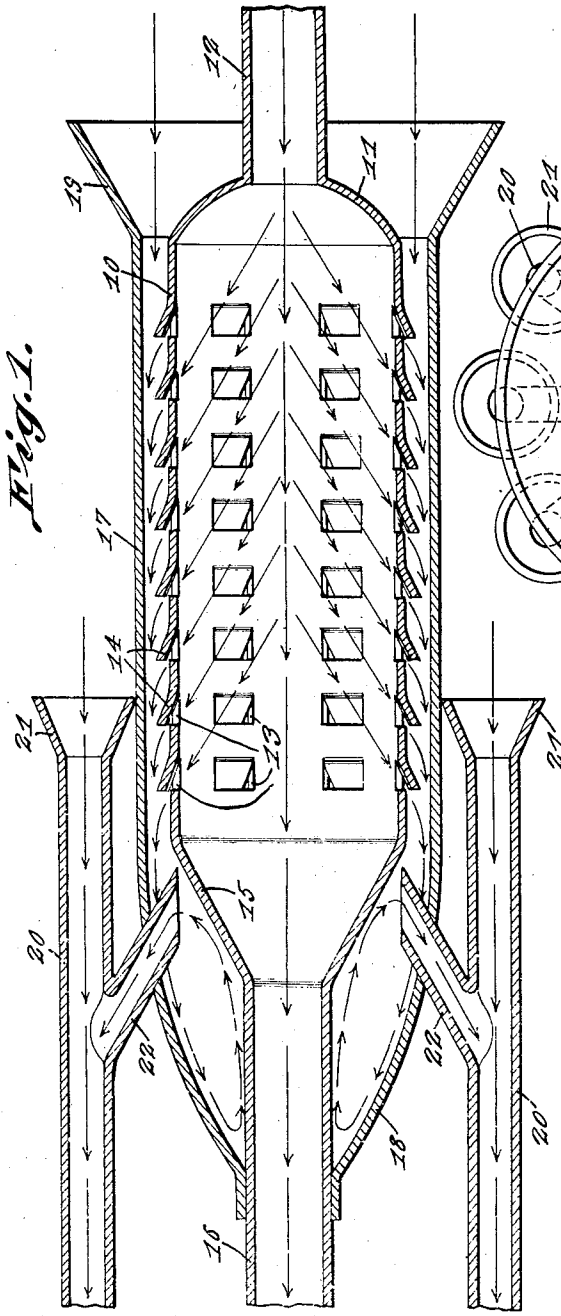


Fig. 1.

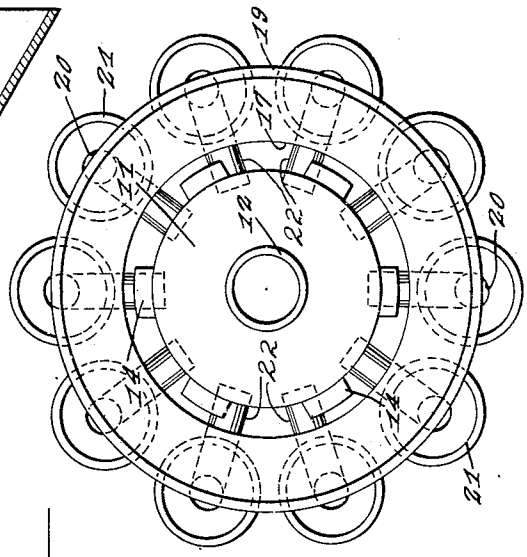


Fig. 2.

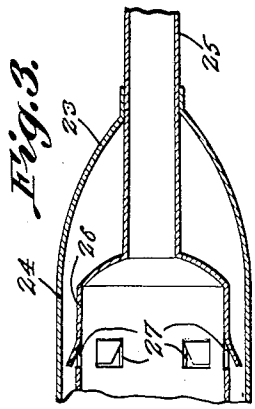


Fig. 3.

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SILENCER FOR EXPLOSIVE ENGINES

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Application June 7, 1938, Serial No. 212,373

1 Claim. (Cl. 181—43)

This invention relates to a silencer for explosive engines and has for an object to provide a device of this character which will separate the heat from the gases and discharge the heat into the atmosphere through the medium of an air blast to permit the exhaust gases to pass with a minimum sound into the atmosphere.

A further object is to provide a silencer for increasing the power of airplane motors by decreasing conventional back pressure to about $4\frac{7}{10}$ths pounds less than normal.

A further object is to provide a device of this character which will be formed of a few strong, simple and durable parts, which will be inexpensive to manufacture, which will be devoid of baffles and which will not easily get out of order.

With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claim without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing forming part of this specification,

Figure 1 is a longitudinal sectional view of a silencer constructed in accordance with the invention, suitable for airplane engines.

Figure 2 is a front elevation of the silencer shown in Figure 1.

Figure 3 is a detail longitudinal sectional view showing a modified form of the invention suitable for automotive engines.

Referring now to the drawing in which like characters of reference designate similar parts in the various views, 10 designates a cylindrical inner casing of the silencer having a convex or other suitable front end wall 11 provided with a pipe 12 adapted to be connected to the exhaust outlet of an airplane engine. The cylindrical wall of the casing is provided with a plurality of apertures 13 having overlying rearwardly inclined deflectors 14 struck from the cylinder wall. The rear wall 15 of the casing is funnel shaped and communicates with an axially disposed pipe 16 which aligns with the pipe 12.

An outer shell 17 is disposed concentrically with and is spaced from the casing 10. The shell is provided with a tapered rear end wall 18 which is sealed around the pipe 16 and has its front end portion flared outwardly to provide a funnel 19 which is open to the atmosphere. The rear end wall of the shell coacts with the exhaust pipe 16 and tapered rear wall 15 of the inner tubular section in forming a trap for gases.

A plurality of tubes 20 are disposed in an annular series around the rear end, or gas trap, of the shell, these tubes extending longitudinally of the shell and having their front end portions located near the central diameter of the shell, and flared to provide funnels 21 which are open to the atmosphere. The tubes project beyond the gas trap and are open in the rear end to the atmosphere. Each tube is provided intermediate its ends with a branch pipe 22 which is inclined rearwardly at an acute angle to the axis of the tube and enters the gas trap of the shell through the tapered rear wall 18 thereof. The end of the tube is beveled off to extend parallel to the axis of the shell, and confronts the funnel shaped rear wall 15 of the cylindrical casing 10 near the forward end of the wall.

In operation, gases from the airplane engine enter the cylindrical casing 10 through the pipe 12 and the heat, or infra red rays, traveling at the speed of light, radiate in all directions and are ejected through the apertures 13. Sound waves entering cylindrical casing 10 through pipe 12 disperse in all directions with a speed of over 1000 feet a second and escape through the apertures 13. The deflectors 14 deflect the sound and heat rearwardly as indicated by the arrowheads between the inner cylindrical casing and the outer cylindrical shell, such movement being accelerated by air pressure as the air is scooped into the entrance funnel 19. Air currents passing over the apertures create a partial vacuum in the inner cylinder which assist greatly in removing heat and sound waves from the inner cylinder since the transmission of sound waves in a partial vacuum is very difficult.

The heat and sound waves move in the direction indicated by the arrows into the gas trap until they collide with the conical rear end wall of the outer shell and there, under pressure from cold air entering the funnel 19 of the shell, heat and sound are dissipated. As the pressure in the gas trap at the conical rear end of the outer shell increases the remainder of the heat and sound waves follow the course indicated by the arrows along the funnel shaped outer rear end 15 of the inner casing, until a saturation point is reached whereupon the heat, sound now dissipated, is drawn into the tubes 20 through the branch pipes 22 that extend at a rearward angle to the outer shell, and then are expelled into the outside atmosphere. This expulsion is accelerated by the suction created in the tubes 20 through

the medium of air scooped into the entrance funnels 21 of the tubes. The residue of spent gases from the airplane engine comprising solids such as carbon, move in a rectilinear direction indicated by the aligned axially disposed arrows in the pipe 12, casing 10 and pipe 16, and are discharged into the atmosphere.

The form of the invention shown in Figure 1 is adapted for use in connection with constant load engines such as airplane engines. The modified form of the invention shown in Figure 3 is adapted for use in connection with engines which are not under constant load, such as automotive engines. The only difference between the form of the invention shown in Figure 3 and the form of the invention shown in Figure 1, is that the front end 23 of the outer shell 24 is substantially conical and is sealed to the exhaust pipe 25 which leads from the engine. It is found that the tubes 20 heretofore described are all that is necessary to create a suction between the outer shell 24 and the inner cylindrical casing 26 for withdrawing heat, that is, infra red rays and sound waves from the inner cylinder through the orifices 27.

It has been found in practice that the silencer increases engine power even over an engine not equipped with a muffler. Airplane motors exhaust against an atmospheric pressure of about 14.7 pounds over absolute zero. The silencer reduces this pressure to about 10 pounds in the area within the front end of the inner cylindrical casing 10, or about 4.7 pounds less back pressure.

From the above description it is though that the construction and operation of the invention will be fully understood without further explanation.

What is claimed is:

A silencer comprising an enlarged tubular inner section open at both ends and adapted to be interposed in the exhaust line of an explosive engine and formed with a plurality of apertures, rearwardly extending deflectors overlying the apertures, an outer shell having a tapered rear portion sealed upon the exhaust line in rear of the inner tubular section, said tapered rear portion coacting with the exhaust pipe and inner tubular section in forming a gas trap, said shell having the front end portion flared outwardly and open to the atmosphere to scoop air into the space between the inner section and outer shell and into the gas trap, a plurality of longitudinally extending tubes disposed exteriorly of the outer shell and having their front end portions flared, the rear ends of the tubes being open to the atmosphere, and rearwardly inclined branch pipes communicating with the tubes and with the gas trap, said tubes and branch pipes withdrawing gases from the gas trap by suction of air scooped into the flared ends of the tubes and passing across the discharge ends of the branch pipes.

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