Oct. 22, 1963 E. A. TOUHEY 3,107,484

APPARATUS FOR REDUCING AIR POLLUTION

Filed Feb. 11, 1963 2 Sheets-Sheet 1

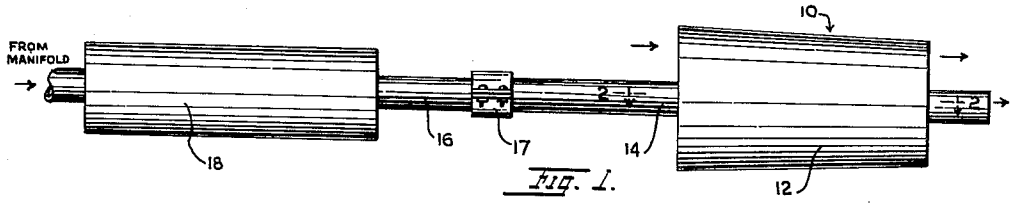


Fig. 1.

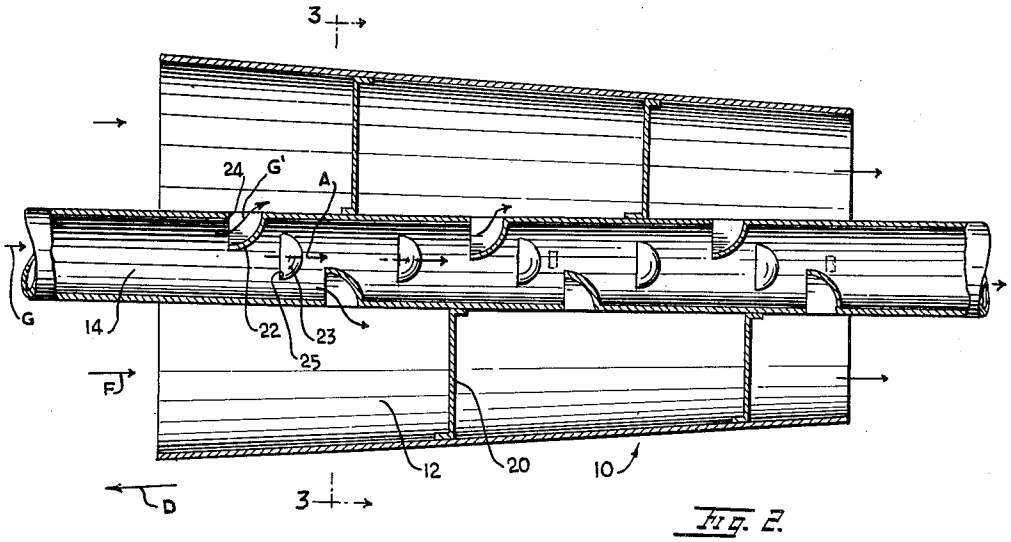


Fig. 2.

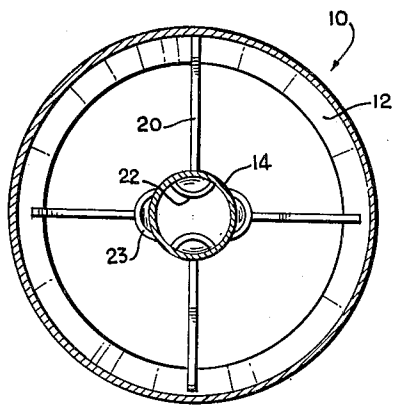


Fig. 3.

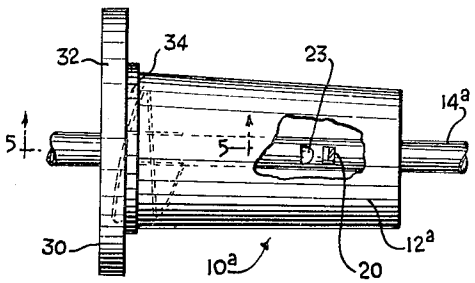


Fig. 4.

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APPARATUS FOR REDUCING AIR POLLUTION

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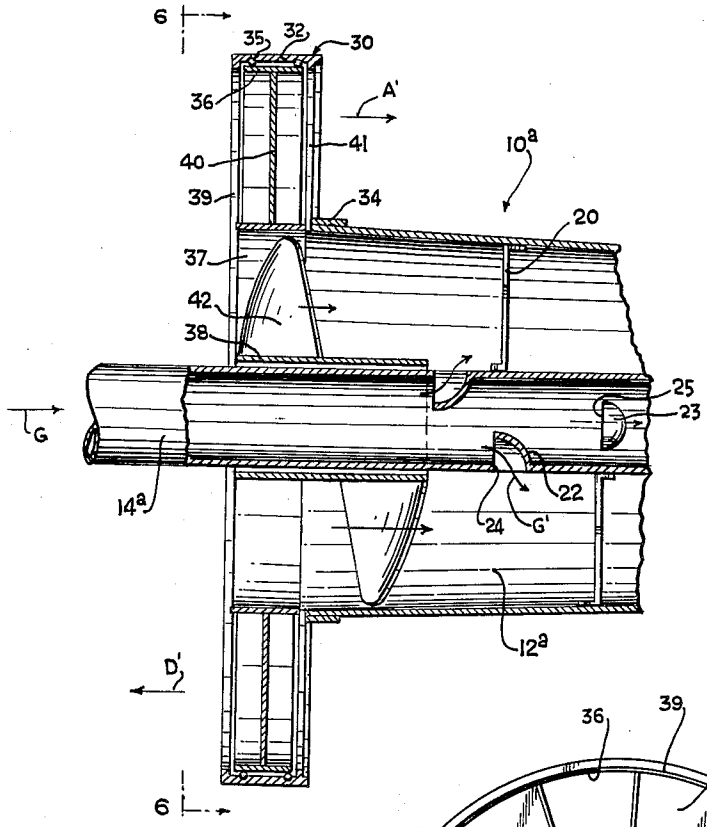


Fig. 5.

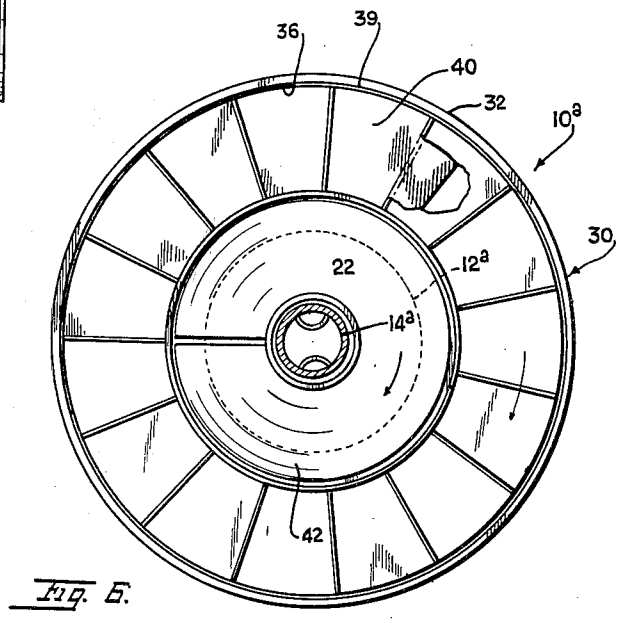


Fig. 6.

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APPARATUS FOR REDUCING AIR POLLUTION

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11 Claims. (Cl. 60—30)

This invention relates to the art of engine exhaust devices and more particularly concerns a device for diluting exhaust gases of internal combustion engines and for reducing the concentration of such gases, the odors, acidity, heat and other objectionable characteristics.

According to the invention there is provided an attachment for a muffler or tail pipe of an internal combustion engine, preferably of the type installed in vehicles. The tail pipe is provided with fins at lateral openings in the tail pipe to divert part of the exhaust gases out of the pipe. Around the pipe is a tubular casing which collects ambient air and mixes it with the exhaust gases entering from the tail pile. The tail pipe may be provided with further fins at openings therein to divert air into the tail pipe to dilute gases therein. In a modified form of the invention rotary vanes are carried by the tubular casing for turning a rotor which includes a helical blade for drawing fresh air into the casing. The attachment serves to reduce the back pressure at the muffler and engine to increase the efficiency of the engine. In addition, the device serves to dilute the exhaust gases with fresh air so that odors and corrosive and toxic qualities are reduced.

It is therefore a principal object of the invention to provide an exhaust device for an engine, including a tail pipe and a casing concentric therewith for passing air therethrough, the pipe being provided with fins at openings for diverting exhaust gases into the casing and for diverting air into the tail pipe.

A further object is to provide an exhaust device as described with means for creating a high speed draft of air through the casing.

Another object is to provide an exhaust device as described wherein an air driven rotor drives air at increased speed through the casing.

A most important object of the invention is to provide means for diluting and cooling engine exhaust gas, for reducing its toxic and corrosive qualities, for reducing back pressure at the engine, and for reducing odors of exhaust gas.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIG. 1 is a side elevational view of a device embodying the invention, shown in association with an engine muffler.

FIG. 2 is a sectional view on an enlarged scale taken on line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2.

FIG. 4 is a side elevational view of a device embodying a modification of the invention.

FIG. 5 is a sectional view on an enlarged scale taken on line 5—5 of FIG. 4.

FIG. 6 is an end elevational view partially in section taken on line 6—6 of FIG. 5.

Referring first to FIG. 1, there is shown an exhaust gas treatment device 10 embodying the invention. The device includes an outer tubular casing 12 and an inner tail pipe 14 extending axially through the casing. Pipe 14 may be attached by clamp 17 to nipple 16 extending axially of engine muffler 18. The muffler is conventional and need not be further described.

As shown in FIGS. 2 and 3, the casing 12 is secured concentrically to the pipe 14 by radial ribs or arms 20 welded to the exterior of the pipe and to the interior of the casing. The ribs are spaced apart axially of the pipe and casing. The casing preferably has a tapered conical form with its wider end opening in the direction of movement of the device when the device is carried by a vehicle in direction D to the right as indicated in FIG. 2.

When the device moves in direction D, then fresh air enters the casing as indicated by arrows F in opposite direction. A plurality of fins 22 are formed in the pipe by punching and pressing inwardly to define openings 24 in the sides of the pipe. These fins extend at substantially 45° to the inner side of the pipe and serve to divert exhaust gas G radially outwardly of the pipe as indicated by arrows G'. Further fins 23 may be punched and pressed outwardly to define openings 25. Air F will be diverted into the pipe from the casing as indicated by arrows A.

The tapered form of the casing 12 causes the air to increase in speed as it passes through the casing. This has the desirable effect of causing a suction effect in pipe 14 which reduces engine back pressure.

In FIGS. 4, 5 and 6 is shown a modification of the invention. The device 10^a is similar to device 10 and corresponding parts are identically numbered. At the front end of casing 12^a is an air driving assembly 30 including an outer stationary cylindrical ring 32 held concentric with casing 12^a and pipe 14^a by radial ribs or arms 33 secured to an inner ring 34. Ring 34 is secured by welding or the like to the end of casing 12^a.

Ring 32 serves as a bearing race for ball bearings 35 which rotatably support a rotor ring 36. Concentric with ring 36 and inside this ring is ring 37. Concentric with and inside ring 37 is tube 38 which is loosely fitted around pipe 14. Connected between rings 36 and 37 is a series of vanes 40. These vanes are flat blades angularly disposed to the axial direction of the rings 36, 37 to define narrow oblique air passages therebetween. Secured between ring 37 and tube 38 is a helical vane or blade 42. The rotor forms a unitary assembly which rotates inside of stator ring 32. End flanges 39, 41 hold ring 36 in ring 32.

When the device 10^a is carried forwardly in the axial direction D' as indicated in FIG. 6, the vanes 40 are caused to rotate by passage of air through them as indicated by arrows A'. This air flowing over and past the casing 12^a serves to cool this casing. The rotating vanes cause the ring 37, blade 42 and tube 38 to rotate which draws air into the casing 12^a at higher speed than it would otherwise be drawn without the helical blade. The vanes 40 are so pitched that the rotor rotates very rapidly and the helical blade 42 draws ten or more times the volume of air into the casing than occurs in housing 12 of device 10 for the same forward speed of movement of the device. The helical blade 42 acts like a screw to draw the air into the housing 12^a. The rotary force is supplied via the outer radial vanes 40.

The exhaust gases G, G' are more effectively diluted, cooled, dried and dispersed in the device 10^a than in device 10. However, for a lower cost construction the rotor may be omitted from the casing leaving the structure of device 10.

In both devices 10 and 10^a, part of the exhaust gases in diluted form pass directly through and out of the pipe 14 or 14^a while the remainder of the gases in diluted form pass out of the casing 12 or 12^a.

In any case the noxious qualities of the exhaust gases are modified so that they are substantially odorless, less corrosive, and less toxic.

The several devices described can be fabricated by

standard types of metal working machinery at low cost. The devices can be quickly installed in any vehicle as original equipment or as a replacement or accessory attachment for the tail pipe.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, and a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing.

2. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, and a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said pipe having further fins at further openings therein extending outwardly of said pipe at an angle to the axis thereof for guiding air from the casing into the pipe to dilute exhaust gas therein.

3. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, and a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said casing being tapered in form and having its wider end disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing.

4. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, and a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said pipe having further fins at further openings therein extending outwardly of said pipe at an angle to the axis thereof for guiding air from the casing into the pipe to dilute exhaust gas therein, said casing being tapered in form and having its wider end

disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing.

5. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectievly extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, and rotor means at said one end of the casing for drawing air into the casing at higher speed and greater volume than is possible without the rotor.

6. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, and a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said pipe having further fins at furhter openings therein extending outwardly of said pipe at an angle to the axis thereof for guiding air from the casing into the pipe to dilute exhaust gas therein, said casing being tapered in form and having its wider end disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing, and rotor at the wider end of the casing for drawing air into the casing at higher speed and greater volume than is possible without the rotor.

7. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, a stator ring supported concentric with the casing at said one end thereof, a rotor rotatably carried by said stator ring, said rotor comprising a series of vanes extending circumferentially of said casing and radially thereof, said vanes being driven by air to rotate the rotor within said ring, and a helical blade carried by said vanes and disposed circumferentially around the pipe within said casing, said blade drawing air into the casing as the vanes are rotated by air outside the casing for diluting the exhaust gas.

8. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said pipe having further

fins at further openings therein extending outwardly of said pipe at an angle to the axis thereof for guiding air from the casing into the pipe to dilute exhaust gas therein, a stator ring supported concentric with the casing at said one end thereof, a rotor rotatably carried by said stator ring, said rotor comprising a series of vanes extending circumferentially of said casing and radially thereof, said vanes being driven by air to rotate the rotor within said ring, and a helical blade carried by said vanes and disposed circumferentially around the pipe within said casing, said blade drawing air into the casing as the vanes are rotated by air outside the casing for diluting the exhaust gas.

9. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said casing being tapered in form and having its wider end disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing, a stator ring supported concentric with the casing at said one end thereof, a rotor rotatably carried by said stator ring, said rotor comprising a series of vanes extending circumferentially of said casing and radially thereof, said vanes being driven by air to rotate the rotor within said ring, and a helical blade carried by said vanes and disposed circumferentially around the pipe within said casing, said blade drawing air into the casing as the vanes are rotated by air outside the casing for diluting the exhaust gas.

10. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally

disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said casing being tapered in form and having its wider end disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing, and a rotor at the wider end of the casing for drawing air into the casing at higher speed and greater volume than is possible without the rotor, said rotor including vanes disposed radially outside of the casing for rotating the rotor and a blade disposed radially inside the casing for driving air through the casing.

11. An engine exhaust device, comprising an elongated tail pipe for receiving exhaust gas from an engine of a vehicle, a tubular casing, radial means supporting said casing concentric with said pipe with said pipe passing axially through said casing, said casing being horizontally disposed for passing fresh air therethrough from one end to the other when moved axially by said vehicle, said pipe having longitudinally spaced openings therein, a plurality of fins at said openings respectively extending inwardly of said pipe at an angle to the axis thereof so that exhaust gas is guided by said fins and passes out through said openings into said casing to mix with fresh air passing through the casing, said pipe having further fins at further openings therein extending outwardly of said pipe at an angle to the axis thereof for guiding air from the casing into the pipe to dilute exhaust gas therein, said casing being tapered in form and having its wider end disposed forwardly in the direction of movement by said vehicle to increase the speed of air passing through the casing, and a rotor at the wider end of the casing for drawing air into the casing at higher speed and greater volume than is possible without the rotor, said rotor including vanes disposed radially outside of the casing for rotating the rotor and a blade disposed radially inside the casing for driving air through the casing.

No references cited.