United States Patent

Thrun

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[54] **VEHICLE POLLUTION CONTROL UNIT**

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[51] **Int. Cl.** **F28f 19/00**

[58] **Field of Search**.....165/51, 134, 135, 136, 181, 165/182

[56] **References Cited**

UNITED STATES PATENTS

2,047,080 7/1936 Maniscalco.....165/135

2,047,249 7/1936 Ballard.....165/182

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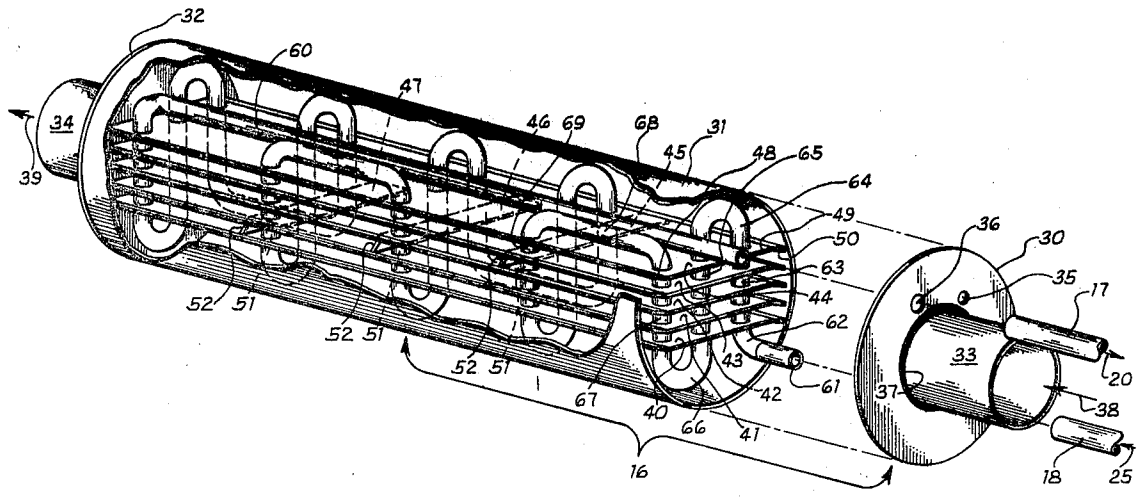
[57] **ABSTRACT**

An apparatus for controlling the pollutants in engine exhaust gases. A housing contains a hollow tube having heat transfer plates attached which extend the length of the housing. Baffles are positioned along the length of the housing between the heat transfer plates. The housing is capped on both ends and is provided with an inlet and outlet pipe for the exhaust gases to pass through. A fluid coolant is circulated through the tube to cool the exhaust gases within the housing.

6 Claims, 2 Drawing Figures



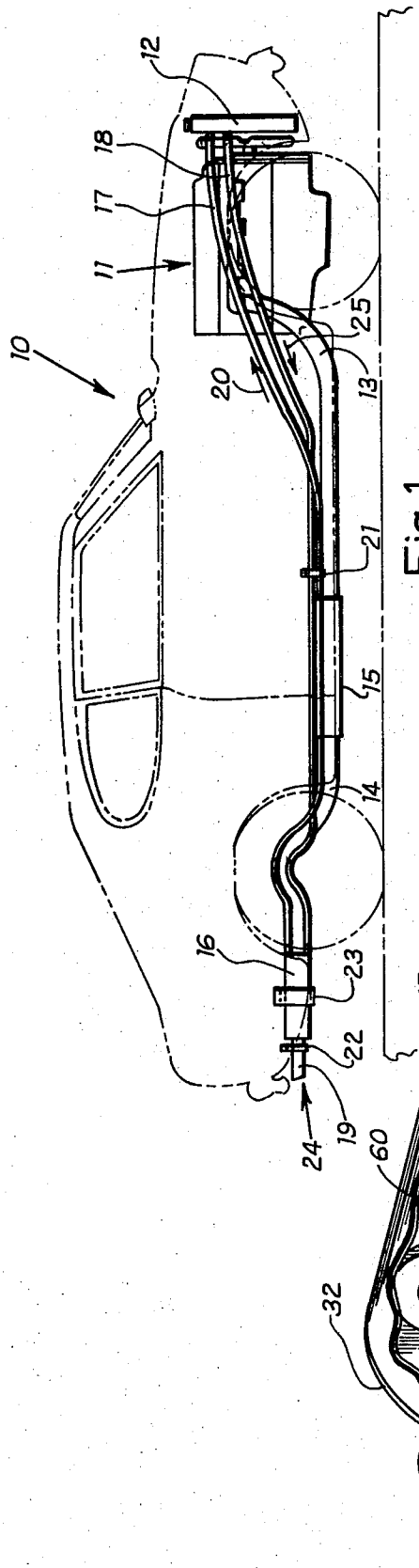


Fig. 1

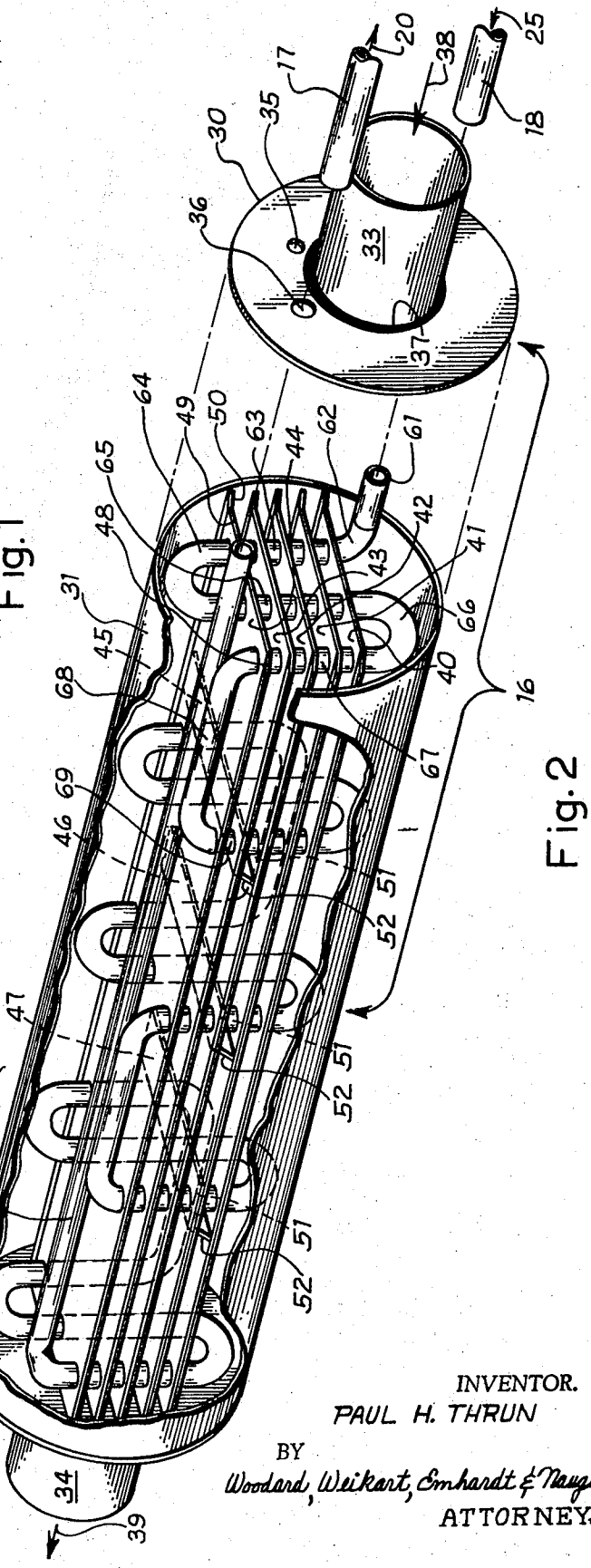


Fig. 2

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VEHICLE POLLUTION CONTROL UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is an anti-pollution apparatus for controlling engine exhaust gases.

2. Description of the Prior Art

It is well known that engines, particularly of the internal combustion type, emit various gases, such as carbon monoxide and hydrocarbons, which contribute to the pollution of the environment. Thus, several devices have been provided with an object of eliminating or reducing the pollution caused by engine exhaust gases. Four of the devices are disclosed in the following U.S. Pat. Nos. 3,071,449 issued to Shustack, 3,490,878 issued to Russell, 3,142,150 issued to Pearlman, and 3,325,256 issued to Calvert. Typically, the aforementioned devices heat the exhaust gases to a sufficiently great temperature so as to cause the hydrocarbons to combine with oxygen in the presence of a catalyst thereby resulting in oxidation of the gases. In spite of the devices which have been provided, an effective inexpensive means has not been devised to reduce the pollutants existing in engine exhaust gases. As a result, many statutes have been enacted specifically defining the level of pollutants allowable in the exhaust gases of various vehicles.

From the above background it can be seen that there is a need for an effective apparatus for controlling the pollutants in the exhaust gases of engines. The apparatus should be inexpensive and easy to mount on automobiles and should provide for the breakdown of the noxious exhaust gases into various non-noxious components. The present invention provides such an apparatus by subjecting the hot exhaust gases to a significently lower temperature thereby oxidizing and breaking the noxious exhaust gases into the various non-noxious components.

SUMMARY OF THE INVENTION

This invention is an apparatus for controlling the pollutants existing in engine exhaust gases. A cylindrical hollow housing capped on either end by a plate contains a hollow tube. Heat transfer plates extending within the housing are fixed to the tube and are spaced apart by baffles. The plates and baffles are configured to force the incoming exhaust gases into a swirl. Hollow pipes are provided in either end of the housing for connecting to the exhaust system of the engine thereby allowing the exhaust gases to pass therethrough. A fluid coolant is circulated through the tube.

It is an object of the present invention to provide a device for controlling the pollutants existing in exhaust gases.

It is another object of the present invention to provide an anti-pollution device which is inexpensive and which may be quickly connected to an exhaust system for control-ling the pollutants in exhaust gases exiting the engine.

Yet another object of the present invention is to provide a vehicle pollution control unit which breaks noxious exhaust gases from an engine into various non-noxious entites.

Related objects and advantages of the present invention will be apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of an automobile having a vehicle pollution control unit incorporating the present invention.

FIG. 2 is an enlarged exploded perspective view of the control unit shown in FIG. 1 with a portion of the device cut away to show its components.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawing and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring now more particularly to FIG. 1, there is illustrated an automobile **10** having an internal combustion engine **11** and a radiator **12**. A conventional exhaust pipe **13** is fixedly fastened to the exhaust manifold of engine **11** with a muffler **15** connected to its opposite end. A second pipe **14** is connected to the opposite end of muffler **15** and is fixedly fastened to the inlet of vehicle pollution control unit **16**. A third pipe **19** is connected to the opposite end of unit **16** allowing the exhaust gases to escape to the atmosphere out through outlet **24**. A suitable clamping device **22** extends around pipe **19** being firmly anchored to the frame of automobile **10**. Likewise, clamp **23** extends around the body of unit **16** and is firmly anchored to the frame of automobile **10**. Thus, clamps **22** and **23** prevent the pipe and unit from falling from the automobile when subjected to shock. As will be described later in this specification, unit **16** requires coolant from radiator **12**. Thus, coolant hoses **17** and **18** are connected to radiator **12** and extend back to the rear of automobile **10** fastening to unit **16**. Clamp **21** extends around hoses **17** and **18** and is anchored to the frame of automobile **10** thereby securing the hoses to the automobile. Additional clamps may be used throughout the automobile at strategic locations to secure hoses **17** and !**18** to the automobile. Likewise, clamps will be used to secure muffler **15** and pipes **14** and **13** to the automobile. The techniques required to clamp the hoses, pipes, pollution control unit and muffler are well known and thus this specification will not elaborate thereon. Likewise, it is also well known how to connect a hose to a radiator. For example, radiator **12** may be provided with two hollow pipes opening into the interior of the radiator and sized to receive hoses **17** and **18**.

Many cars presently available have a resonator fixedly fastened between pipes **14** and **19**. These resonators may be removed from the automobile and unit **16** may be inserted in its place. In vehicles having resonators, it will be necessary to separate the tail pipe of the automobile into two pieces in order that unit **16** may be inserted therebetween. Of course, cars having multiple exhaust pipes may be provided with multiple pollution control units **16** whereas automobiles having only one

exhaust pipe would be equipped with only one control unit **16**.

FIG. **2** is an enlarged view of the control unit and is cut away to show the components. In addition, end plate **30** has been removed from the device for sake of clarity. Of course, in actual use plate **30** would be secured to housing **31**.

Unit **16** has a hollow cylindrical housing **31** securely fastened to forward end plate **30** and back end plate **32**. Housing **31** and plates **30** and **32** may be made from stainless steel with back plate **32** being welded to housing **31**. Forward plate **30** is secured to housing **31** by welding or by fastening devices. In the latter case, right angle brackets, not shown, are fixedly fastened to the interior of housing **31** having nuts for engaging screws passing through plate **30** and securing plate **30** to housing **31**. Inlet exhaust pipe **33** is integrally attached to plate **30** by weld **37**. Likewise, outlet exhaust pipe **34** is integrally attached to plate **32** by welds not shown. Pipe **33** is hollow allowing the exhaust gases to enter unit **16** in the direction of arrow **38**. Pipe **34** is also hollow allowing the gases to exit unit **16** in the direction of arrow **39**. Pipe **33** is securely fastened to pipe **14** whereas pipe **34** is securely fastened to pipe **19** by conventional clamping devices.

A tube is provided within housing **31** for circulating the coolant from radiator **12**. The tube may be made from individual pre-formed copper tubes fastened together by means such as solder. Coolant flows out of radiator **12** through tubing **18** in the direction of arrow **25** entering unit **16** through inlet tube **61**. Tube **61** is fixedly fastened to a right angle configured tube **62** which in turn is fixedly fastened to a straight tube **63**. Tube **63** is fixedly fastened to a **180** degree bend **64** which has its opposite end fixedly fastened to straight tube **65**. Tube **65** is fixedly fastened to another **180** degree bend **66** which has its opposite end fixedly fastened to straight tube **67**. Tube **67** has its opposite end fixedly fastened to extension tube **68** which in turn is fixedly fastened to a straight piece of tubing **69**. As may be seen from FIG. **2** additional individual tubes are connected together forming the final configured tube. In the embodiment shown in FIG. **2**, the following number of individual tubes are utilized: one inlet tube **61**, fifteen straight tubes, ten **180** degree bend tubes, four extension tubes **68**, and one outlet tube **60**. Of course, it would be possible to add many more bends to the configuration shown in FIG. **2**. Likewise, it would be possible to reduce the number of bends making up the configuration shown, depending upon the liquid circulation necessary to activate the heat transfer unit.

Five plates **40**, **41**, **42**, **43** and **44** act as heat sinks and directional fins thereby extracting the heat from the exhaust gases entering pipe **33** in the direction of arrow **38**. The heat from the exhaust gases is conducted to the tube and the coolant therein. Each one of plates **40** through **44** have fifteen holes to receive the tube as it crosses back and forth along the length of housing **31**. These plates may be made from any type of metal; however, excellent results have been obtained by utilizing **25** guage aluminum sheet. The plates may be fastened to the tube by any conventional means, such as soldering or bolting together. Plates **40** through **44** extend from back end plate **32** to forward end plate **30**. Plates **40** through **44** are identical in shape having a flat middle portion **49** integrally joined to an upward turned flange **48** on one side and a downward turned flange **50** on the opposite side. Flanges **48** are turned upward at an approximate angle of thirty degrees from the flat middle portion **49**. Flanges **50** are turned downward at an approximate angle of thirty degrees from the flat middle portion **49**. Flange **48** of the top plate **44** abuts against the inside wall of housing **31** and flange **50** of the lowest plate **40** abuts against the inside wall of housing **31**. The remaining flanges **48** and **50** are in spaced relation from the inside wall of housing **31**.

Three baffle plates **45**, **46**, and **47** are spaced along the length of housing **31** to direct the incoming exhaust gases. Each baffle is identical having a flat portion **51** integrally joined to a downward turned flange **52**. Flanges **52** are turned down approximately 30° from flat portion **51**. Portions **51** are provided with three holes for receiving the coolant tube. Baffle **45** is located under plate **43** and on top of plate **42**. Flat portion **51** of baffle **45** abuts against the lower side of plate **43** whereas the lower edge of flange **52** abuts against the top of plate **42**. Portion **51** of baffle **46** abuts against the lower side of plate **42** and the lower edge of flange **52** of baffle **46** rests on the top side of plate **41**. Portion **51** of baffle **47** abuts against the lower side of plate **41** with the lower edge of flange **52** of baffle **47** resting on top of plate **40**.

Holes are provided in plate **30** allowing inlet tube **61** and outlet tube **60** to pass through the plate. Thus, hole **36** in plate **30** receives tube **60** which is sufficiently long so as to allow hose **17** to be connected thereto. Hose **17** may be made from a flexible material, such as rubber, and may therefore be slipped over tube **60** with a clamping device, not shown, securing hose **17** to tube **60**. A similar hole not shown is provided in plate **30** allowing tube **61** to extend through the plate and allowing hose **18** to be secured to tube **61**. A third hole **35** having an approximate diameter of **3/8** of an inch is provided in plate **30** allowing air from the outside environment to enter housing **31** to insure proper oxidation of the gases therein.

The exhaust gases exit engine **11** through pipe **13**, muffler **15** and pipe **14** entering unit **16** through pipe **33**. A major portion of the gases are deflected downward and outward along the top of plates **42**, **41** and **40** by baffles **45**, **46** and **47**. These baffles extend the width of horizontal portions **49** ending approximately at the junction between flanges **48** and portion **49** and the junction between flanges **50** and portion **49**. These gases are then swirled in a clockwise direction, as viewed looking into housing **31** through pipe **33**, since flanges **48** turn upward and flanges **50** turn downward. The swirling action insures that the gases are properly mixed through the unit thereby allowing maximum heat transfer to the cooling plates **40** through **44** and also insuring that the noxious exhaust gases break into its non-noxious components. Simultaneously, the coolant from radiator **12** is circulated through the continuous length of tubing at a temperature between 200° F. and 300° F. A coolant pump is not required since the continuous cycling of the coolant from the engine to the radiator produces sufficient pressure to also circulate the coolant out hose **18** and through unit **16** and back to the radiator via hose **17**. Suitable chemicals may be added to the coolant in

radiator 12 to prevent the water from boiling. Excellent results have been obtained by adding liquid fluorinated hydrocarbons sold under the trademark "Freon" to the coolant in radiator 12. "Freon" is sold by the E. I. De Pont DeNemours and Co., Wilmington, Delaware, 19898. Excellent results have also been obtained by adding one pint of radiator coolant to 70 percent of permanent anti-freeze and then filling the radiator with water.

Baffles 45, 46, and 47 prevent the exhaust gases from immediately exiting outlet 34 thereby creating a back pressure in the exhaust system. The back pressure insures that a greater percent of the gasoline within the engine cylinders is burned. The gases entering pipe 33 are at a temperature between 700° to 1000° F. and impinge immediately on the plates, baffles, and coolant tubes which are at temperatures between 200° to 300° F. As a result of the sudden change in temperature in conjunction with the air entering hole 35 the incoming gases are broken down exiting pipe 34 as individual non-noxious components.

It has been determined that a typical automobile cruising 40 miles per hour and not equipped with the present invention may have exhaust gases exceeding 73 grams of carbon monoxide and 11 grams of hydrocarbon per mile of driving. With the anti-pollution device of the present invention installed on the same automobile cruising at the same speed, the exhaust gases contain less than 30 grams of carbon monoxide and less than 3 grams of hydrocarbon per mile of driving, and less than three oxides of nitrogen grams per mile.

The present invention may be utilized on other types of engines, for example, diesel engines. In addition, the device may be utilized on vehicles other than automobiles. It will be obvious from the above description that the present invention provides an apparatus for controlling the pollutants existing in exhaust gases. It will be further evident from the above description that the anti-pollution device of the present invention may be quickly and inexpensively manufactured and attached to automobiles for controlling the pollutants existing in the automobile exhaust gases. It will be further evident from the above description that the anti-pollution device breaks down the noxious exhaust gases from an engine into various non-noxious entities.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in the art. For example, the number of plates 40 through 44 may be changed as well as the number of baffles 45 through 47. In addition, the configuration of the tube may be changed as well as the size of housing 31.

The invention claimed is:

1. A control unit for reducing pollutants in exhaust gases from an engine comprising:

a housing having an inlet and an outlet connectable to and communicating with said engine so as to receive said exhaust gases;

a tube extending through said housing, said tube being hollow for circulating coolant therein;

and plates fixed to said tube to transfer heat from said gases to said tube, said plates each having a flanged end positioned adjacent said housing creating a swirling gas flow around the longitudinal axis of said housing as said exhaust gases pass therethrough;

baffles spaced between said plates to direct the flow of said gases; and wherein:

said plates are parallel and are in spaced relation to each other forming passages for said gases to flow.

2. A control unit for reducing pollutants in exhaust gases from an engine comprising:

a housing having an inlet and an outlet connectable to and communicating with said engine so as to receive said exhaust gases;

and means connected with said housing to cool said exhaust gases; wherein said means comprises:

a tube extending through said housing, said tube being hollow for circulating coolant therein;

plates fixed to said tube to transfer heat from said gases to said tube;

baffles spaced between said plates to direct the flow of said gases; and wherein:

said plates are parallel and are in spaced relation to each other forming passages for said gases to flow, each of said plates have a flat middle portion, an upward turned flange and a downward turned flange integrally joined together;

each of said baffles are positioned in said passages, each of said baffles have a downward turned portion abutting one of said plates directing said gases to said upward turned flanges and said downward turned flanges.

3. The unit of claim 2 additionally comprising:

an end cap connected to said housing having a hole communicating the interior of said housing with the outside atmosphere.

4. The unit of claim 3 additionally comprising:

means for causing said tube to have a surface temperature between 200° Fahrenheit and 300° Fahrenheit while said exhaust gases are flowing through said housing.

5. The unit of claim 4 wherein:

said unit is connected to an automobile having a radiator and exhaust system, said inlet of said housing is connected to said exhaust system, said tube is connected to said radiator.

6. The unit of claim 4 wherein:

said tube is configured to cross back and forth the width and length of said housing passing through said plates and baffles.

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