United States Patent

Cross

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[54] EXHAUST GAS CLEANSING SYSTEM

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[58] **Field of Search** ..... 60/31, 30 L, 309, 320; 55/DIG. 30

[56] **References Cited**

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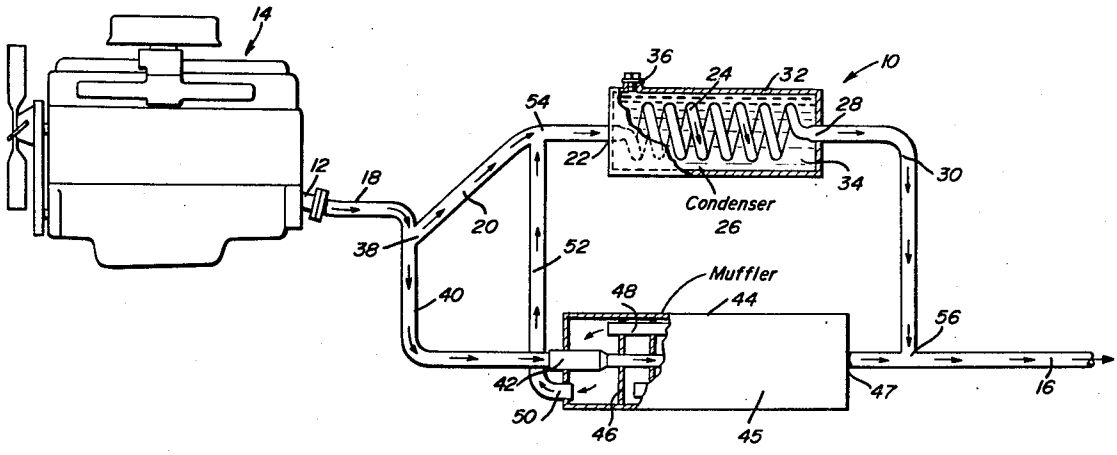
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[57] **ABSTRACT**

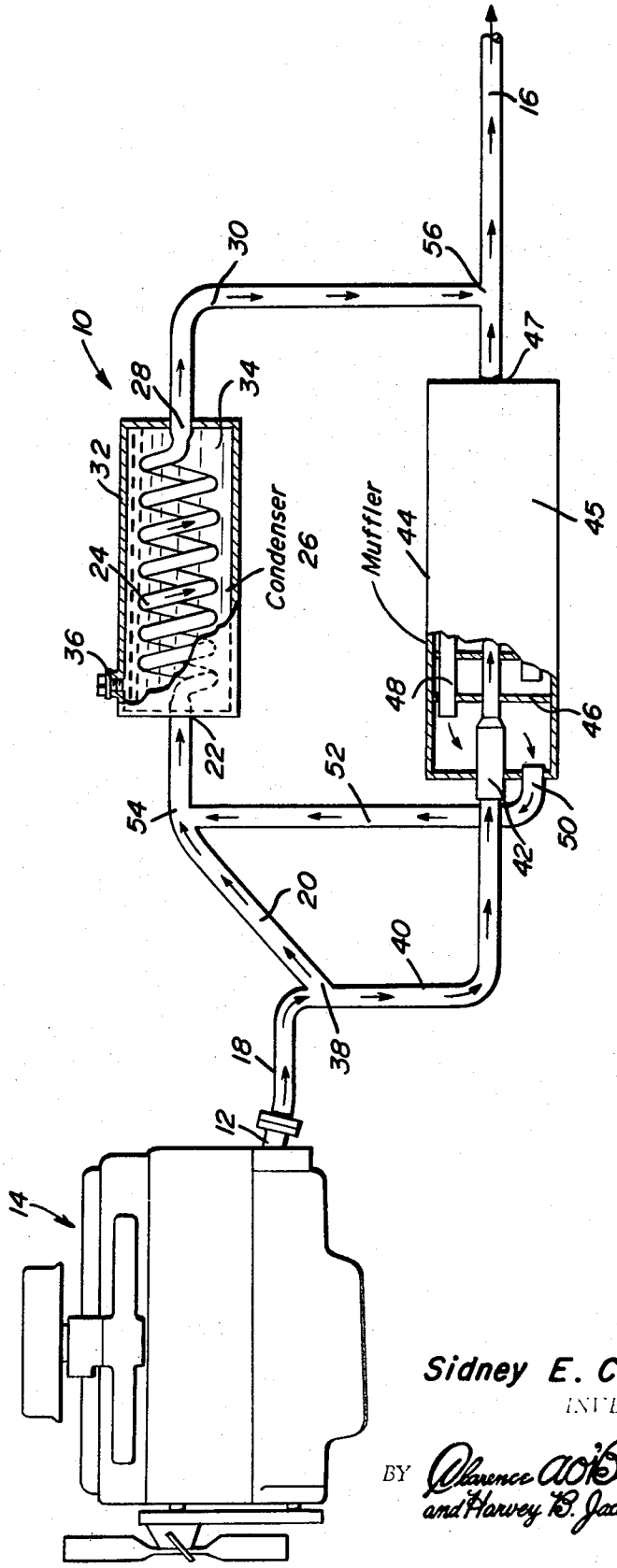
The exhaust manifold of an internal combustion engine is connected to a header pipe that branches to parallel connected inlet ports of a liquid cooled condenser and a muffler. The outlet ports of the condenser and muffler are connected in parallel to a tailpipe. A conduit section communicates between the interior of the muffler and the inlet port of the condenser thereby enabling some of the gas acted upon by the muffler to be also treated by passage through the condenser. A substantial amount of hydrocarbon material condenses in the condenser so that purified exhaust gas is delivered from the outlet port of the condenser to the tailpipe.

4 Claims, 1 Drawing Figure



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EXHAUST GAS CLEANSING SYSTEM

THE FIELD OF THE INVENTION

The present invention relates to emission control devices for internal combustion engine vehicles and more particularly to a combination of a condenser and muffler which reduces the hydrocarbon content of exhaust gases.

SUMMARY OF THE PRIOR ART

During the present time, state and federal laws require emission control devices on vehicles having internal combustion engines. The most prevalent approach to emission control includes apparatus for feeding back a certain amount of emission gas into the combustion chambers where it is recombusted. Although the efficiency of the presently employed apparatus is debated by experts, it is generally agreed that presently installed emission control devices lower the performance characteristics of vehicles. Accordingly, it would be desirable to provide vehicles with a system for cleansing or filtering exhaust gas without interfering with the performance of a vehicle.

SUMMARY OF THE INVENTION

The present invention includes the provision of liquid cooled condenser and a muffler combination that simultaneously operate upon exhaust gases coming from the exhaust manifold of an internal combustion engine. The outlet ports of the condenser and muffler are jointly connected to a tailpipe through which cleansed gas flows. A conduit communicates the interior of the muffler to the inlet portion of the condenser. Thus, the condenser actually operates upon the joined flow from the exhaust manifold of the engine and a controlled amount of gas that is fed back from the muffler.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

The FIGURE illustrates the connection of a header pipe to the exhaust manifold of an internal combustion engine. The delivery end of the header pipe is connected to the condenser-muffler combination that constitutes the heart of the invention.

Referring to the drawing, the cleansing or filtering system of the present invention is indicated by reference numeral **10**. The system is connected between the exhaust manifold terminal **12** of an internal combustion engine **14** and a tailpipe **16**.

A header pipe **18** is connected to the exhaust manifold terminal. The header pipe branches off in two directions. In the first direction, a conduit section **20** communicates with the header pipe **18** and continues to the inlet port **22** of a fluid cooled condenser **26**. The outlet port **28** of the condenser communicates with a conduit section **30** which is connected to the tailpipe **16**. As indicated in the FIGURE, the interior of the condenser **26** includes a coiled pipe **24** which conducts exhaust gas between the inlet and outlet ports **22** and **28**, respectively. A cylindrical jacket **32** surrounds the

coil **24** and fluid **34** is contained within the jacket and may be supplied thereto from and withdrawn therefrom to any suitable source of cooling fluid (not shown). Preferably, the fluid employed is "anti-freeze", such as a mixture of water and ethylene glycol. A filling plug **36** is mounted in the wall of the jacket to allow the jacket to be filled with the fluid and to enable gases to be vented from the jacket. Heated exhaust gases from the header pipe **18** enter the coil **24** of the condenser which cools the exhaust gas. As a result of the cooling, a substantial amount of hydrocarbon material is condensed from the exhaust gas flow. Therefore, a relatively clean or purified gas exits from the outlet port **28**.

A junction point **38** is defined at the intersection of the header pipe **18** and the conduit section **20**. At this junction point an additional conduit section **40** appears in communicating relationship with the header pipe **18**. The pipe section **40** delivers a portion of exhaust gas to the intake port **42** of a muffler **44** which generally resembles a muffler employed on automotive vehicles. More particularly, the muffler **44** includes a cylindrical casing **45** enclosing baffle plates **46**. An exhaust port **47** communicates with the intake port **42** so that a portion of the exhaust gas entering the intake port **42** is delivered at the exhaust port **47** which in turn communicates with tailpipe **16**. A conduit section **48** is disposed within the interior of the muffler **44** with the purpose of feeding back a certain amount of the exhaust gas entering the intake port **42** to a second exhaust port **50** that is physically disposed adjacent the intake port **42**. A conduit section **52** connects the second exhaust port **50** with the inlet port **22** of condenser **26**. Accordingly, a portion of the exhaust gas entering the muffler is fed back for processing by the condenser **26**.

Junction point **54**, defining the intersection of conduit sections **20** and **52**, produces a venturi effect in the conduit section **52** into the inlet port **22**. In a similar manner the gas exiting from the exhaust port **47** causes a venturi effect at a junction point **56** which is the point of intersection between the conduit section **30** and the tailpipe **16**. The venturi effect creates suction in the conduit section **30** which forces gas flow into the inlet port **22** from the conduit sections **20** and **52**.

In the operational state, the exhaust gas from the internal combustion engine is operated upon by the muffler **44** and the condenser **26**. Although the muffler **44** passes a portion of the exhaust gas directly to the tailpipe **16**, a greater portion of the exhaust gas is either directly operated upon by condenser **26** or fed back to the condenser from the interior of muffler **44** by the feedback conduit section **48**. As a result, the gas passing outwardly through the tailpipe **16** is relatively clean or purified due to the filtering action of the condenser, of course, the condensate obtained within the coil **24** of the condenser **26** collects on the inner walls of the coil **24** and is blown therealong, out through the outlet port **28**, along the inner walls of the conduit section **30** and thereafter along the inner walls of the tailpipe **16** for discharging in liquid form from the outlet end of the tailpipe **16**.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention

to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. An exhaust emission control system comprising a condenser having an inlet port for receiving a heated flow of gas and an outlet port for exiting the gas that has been reduced by the condenser, a tailpipe connected to the outlet port for conveying the reduced gas along a predetermined path, the inlet port of the condenser being connected in parallel with the intake port of a muffler means, the muffler means having conduit means communicating between the interior of the muffler means and the inlet port of the condenser means for delivering a portion of the flow passing through the muffler means to the condenser means for processing by the condenser along with the heated flow of gas.

2. In an emission control system for a vehicle having an internal combustion engine, the component parts comprising a header pipe for connection to an engine exhaust manifold, a condenser communicating with the header pipe for cooling exhaust gas delivered by the manifold, conduit means connected to the outlet port of the condenser means for delivering the gas to a tailpipe, and a muffler having a first intake port connected in parallel with the inlet port of the condenser and an exhaust port communicating with the tailpipe, and conduit means communicating between the muffler interior and the condenser for forming a circulating system producing gas in the tailpipe having a reduced hydrocarbon content.

3. The structure of claim 2 wherein the condenser includes a coiled conduit through which the gas passes, and a fluid cooling jacket disposed around the coiled conduit for causing condensation of gas flowing in the coiled conduit.

4. The structure of claim 3 wherein the jacket is filled with "anti-freeze."

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