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Streitz

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[54] **HEAT TRANSFER UNIT**

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[52] **U.S. Cl.** **165/52,** 165/109, 165/179

[51] **Int. Cl.** **F02n 31/08**

[58] **Field of Search** ..... 165/51, 52, 109, 109 T, 165/179

[56] **References Cited**

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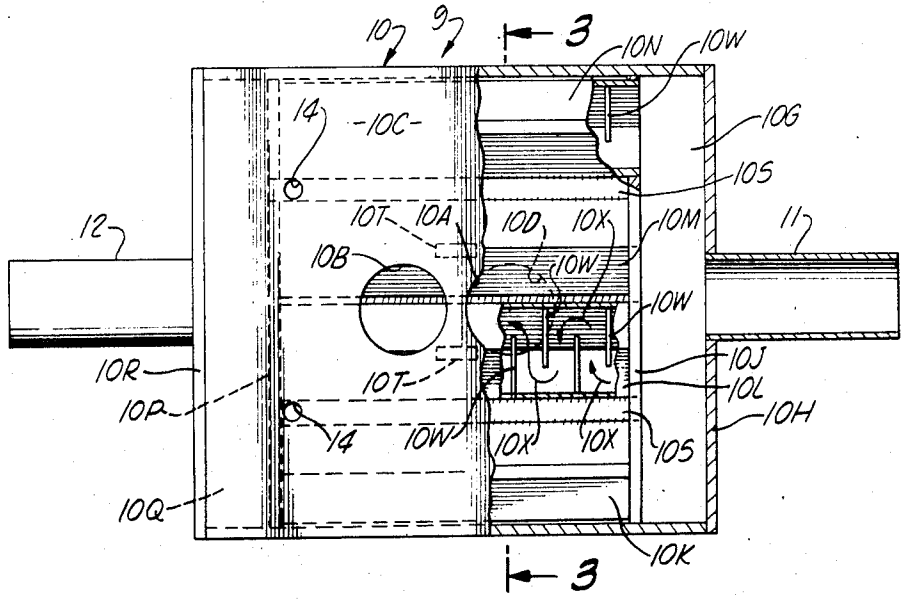
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[57] **ABSTRACT**

A heat exchanger for heating a fuel-air mixture by exhaust gases of an engine. The exchanger is generally rectangular with heat exchanger tubes extending therethrough from an inlet exhaust gas manifold section to an outlet exhaust gas manifold section. The exchanger is adapted to be mounted between the carburetor and intake manifold of the engine.

2 Claims, 3 Drawing Figures



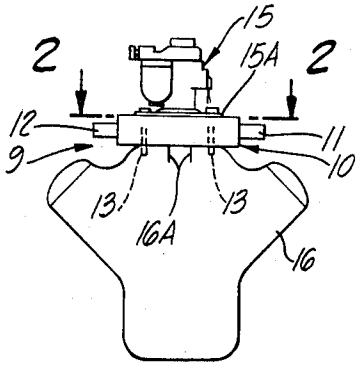
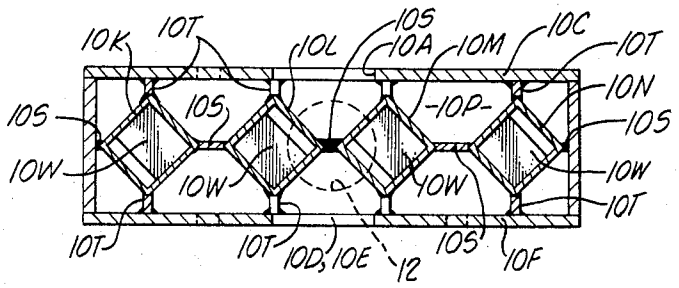


FIG. 1.

FIG. 3.



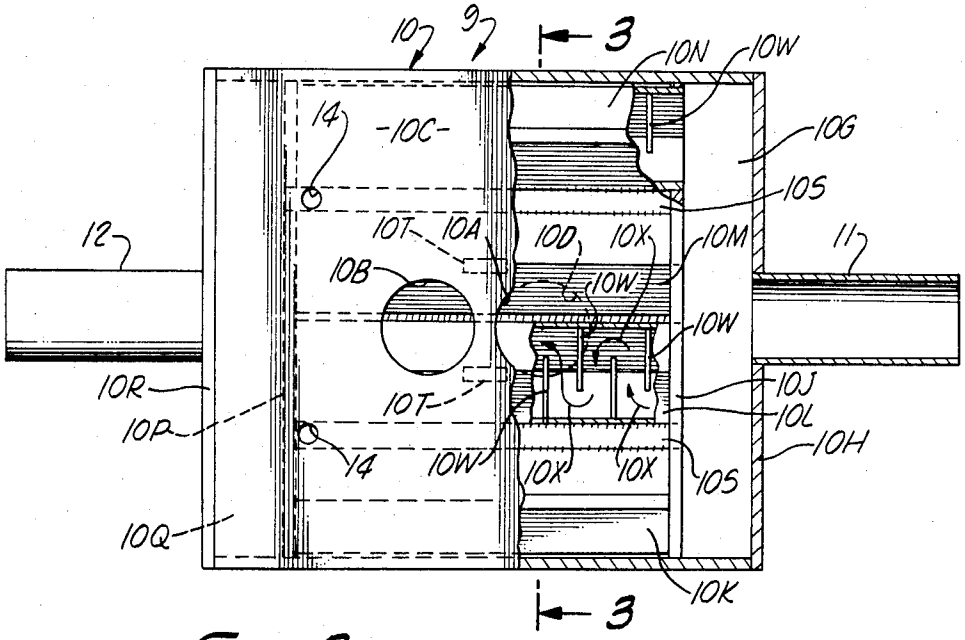


FIG. 2.

HEAT TRANSFER UNIT

The present invention relates to improved means and techniques for increasing the efficiency of operation in an internal combustion engine and involves the concept of using the heat from exhaust gases of the engine to preheat the fuel-air mixture entering the engine.

An object of the present invention is to provide an improved heat exchanger for these purposes which is particularly useful with fuels that have a low percentage of unburnables or residues of any kind.

Another object of the present invention is to provide a heat exchanger for these purposes which improves performance of the engine regardless of the character of the fuel of the engine, using fuels with a low percentage of unburnables or residues of any kind.

Another object of the present invention is to provide an improved heat exchanger for these purposes which is relatively small, compact, and easily installed between the carburetor and its engine.

Another object of the present invention is to provide an improved heat exchanger which will achieve a low exhaust emission of smog creating agents such as nitrogen oxides, carbon oxides and unburned hydrocarbons.

Another object of the present invention is to provide an improved heat exchanger which will make possible a greater B.T.U. output resulting in improved fuel economy.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

FIG. **1** is a view in elevation illustrating the heat exchanger of the present invention mounted on an internal combustion engine between its carburetor and its fuel-air inlet.

FIG. **2** is a sectional view taken substantially as indicated by the line **2—2** in FIG. **1.**

FIG. **3** is a sectional view taken substantially as indicated by the line **3—3** in FIG. **2.**

The heat exchanger is formed of good heat-conducting material which may, for example, be copper, brass, stainless steel and as seen has a rectangular body portion **10** from which tubular pipe portions **11** and **12** extend from opposite ends.

The heat exchanger is mounted in the position shown in FIG. **1** using four mounting bolts **13** which extend through aligned apertured portions of the mounting flange **15A** of carburetor **15,** through apertured portions **14** of the heat exchanger and which are threaded in the engine block **16** or its fuel intake manifold.

In so mounting of the heat exchanger having the general reference number **9,** there is alignment between the fuel-air outlet of the carburetor **15** and the fuel-air intake manifold **16A** of the engine **16.**

The pipe section **11** serves as a conduit for the flow of exhaust gases into the heat exchanger, and the other aligned pipe section **12** serves as the exhaust gas outlet of the heat exchanging unit. Well-known techniques may be used in connecting the pipe sections in the exhaust system of the automobile such that all or only part of the exhaust gases flow through the heat exchanger.

The fuel-air mixture in its travel from the outlet opening of the carburetor **15** to the intake manifold enters the two circular openings **10A, 10B** in the top plate **10C,** and the heated fuel-air mixture leaves through a like pair of openings **10D, 10E** in the bottom plate **10F** in its passage to the engine intake manifold. As seen in FIG. **2,** the exhaust gas inlet pipe **11** conducts exhaust gases to an internal generally rectangular portion **10G** which is in the nature of an inlet manifold which is defined by the upper and lower wall portions **10C, 10F,** wall **10H** and internal apertured wall **10J** upon which one end of each of four generally square conduits **10K, 10L, 10M** and **10N** are supported. These heat exchange conduits or tubes **10K-10N** extend parallel with each other and parallel with the axis of conduits **11** and **12** and terminate at the apertured wall **10P** which supports the other ends of such tubes **10K–10N** and which forms one wall portion of an outlet manifold **10Q** which is defined also by end wall **10R** and the upper and lower wall portions **10C, 10F.** These rectangular tubular portions **10K–10N** are interconnected at various points along their lengths by discontinuous webs which are made discontinuous so as to impede as little as possible the flow of the fuel-air mixture past the tubes **10K–10N,** through the heat exchange unit. These web portions between adjacent tubular sections **10K–10N** and between adjacent side walls are designated by reference numerals **10S,** and the web portions which serve to connect the tubular portions **10K, 10N** to the upper and lower walls **10C** and **10F** are designated by the reference numeral **10T.** As mentioned previously, these web portions are not continuous but are sufficiently long to provide suitable bracing and rigidity between tube sections **10K–10N** and adjacent walls defining the rectangular portion **10.**

It is noted that each of the tubular elements or conduits **10K, 10L, 10M** and **10N** contain baffles **10W** spaced internally and alternately attached to different side wall portions thereof to provide a tortuous path indicated by the arrows **10X** for the flow of exhaust gases so as to achieve a turbulent exhaust gas flow therein and increased surface contact with the tubular elements so constructed.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A heat exchanger for internal combustion engine in which fuel-air mixture is preheated by exhaust gases; a hollow housing structure; inlet and outlet exhaust gas conduit means extending from said hollow housing; means defining an inlet manifold portion in said housing with which said inlet exhaust means is in direct communication; means defining an outlet manifold portion in said housing with which said outlet exhaust gas means is in direct communication; a plurality of elongated tubular elements extending between said inlet and outlet manifold portions and being in communication with the same; and fuel-air inlet and outlet openings in said housing on opposite sides of said tubular elements such that the fuel-air mixture entering its inlet and leaving its outlet is heated by the exhaust

gases flowing through said tubular elements; said hollow housing being defined by at least two parallel walls in which said fuel-air inlet and fuel-air outlet are disposed and aligned apertured portions in said parallel walls through which fastening means may extend; said tubular elements being generally rectangular in cross-section with a pair of diagonal corners of such rectangle being aligned in a direction extending from said fuel-air inlet to said fuel-air outlet; and discontinuous web portions interconnect adjacent tubular elements

and also discontinuous web portions interconnect said tubular portions to internal wall portions of said hollow housing.

2. A heat exchanger as set forth in claim **1** in which open ends of said tubular elements are supported in apertured wall portions which define in part said inlet manifold portion and said outlet manifold portion respectively.

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