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Heath

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[54] **HEAT SHIELDS FOR EXHAUST SYSTEM**

[75] Inventor: **Robert A. Heath**, Jackson, Mich.

[73] Assignee: **Tenneco Inc.**, Racine, Wis.

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[52] **U.S. Cl.** ..... **60/299**, 23/288 F, 60/320, 180/64 A, 181/72

[51] **Int. Cl.** **F01n 3/14**

[58] **Field of Search** ..... 60/299, 320, 298; 23/288 F; 180/64 A; 181/72, 36 C

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Primary Examiner—Douglas Hart

Attorney, Agent, or Firm—Harness, Dickey & Pierce

[57] **ABSTRACT**

External baffles are attached to hot portions of conduits in catalytic emission control exhaust systems to provide means to protect and shield the surrounding environment and dissipate heat.

7 Claims, 5 Drawing Figures

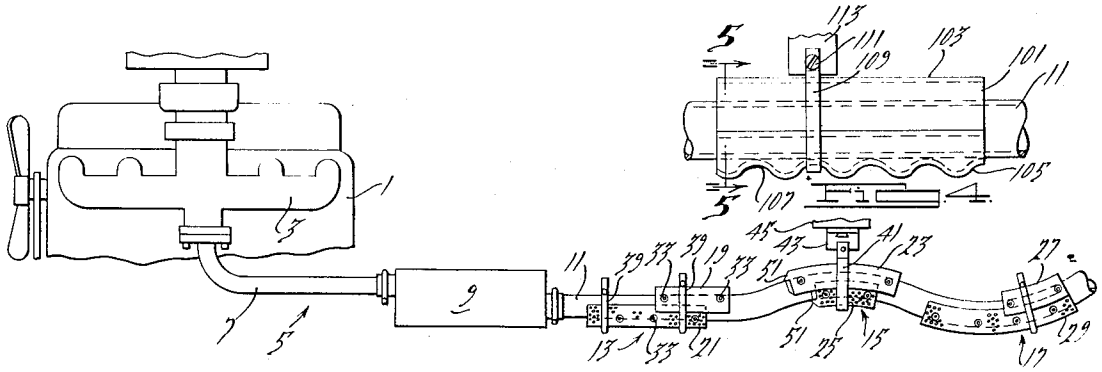


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 5.

HEAT SHIELDS FOR EXHAUST SYSTEM

BACKGROUND OF THE INVENTION

Government regulations will require automotive vehicles with internal combustion engines to limit exhaust gas emissions to a prescribed level; and it appears that catalytic emission control devices in the exhaust gas system will have to be used in order to meet the government requirements. The emission reduction reaction releases substantial heat with the result that components of the exhaust system run considerably hotter than they do in present exhaust systems and may be heated to temperatures in excess of 1,500° F. These hot components in a moving vehicle therefore create a new hazard to the surrounding environment. They may cause heat damage to adjacent non-metallic parts of the vehicle, they may cause grass fires if the vehicle is driven off the road, and they may cause burning of a wide variety of other things under a wide variety of circumstances.

BRIEF SUMMARY OF THE INVENTION

It is the purpose of this invention to provide a protective means for the hot conduits of catalytic exhaust systems for motor vehicles powered by internal combustion engines.

The invention accomplishes this purpose by means of shields that cover portions of the hot conduits to prevent contact with those portions of the conduit. The shields are made of metal and also serve to some degree as a cooling means for the conduit.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation, schematic, of an internal combustion catalytic exhaust system embodying the invention;

FIG. 2 is an enlarged side elevation of a protective heat shield, partly broken away, embodying the invention and showing the shield mounted on a pipe;

FIG. 3 is a cross section along the line 3—3 of FIG. 2;

FIG. 4 shows a modified form of shield mounted on a pipe and including a clamp and hanger means; and

FIG. 5 is a cross section along the line 5—5 of FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

An internal combustion engine 1 has an exhaust manifold 3 that discharges exhaust gases into an exhaust system 5. The exhaust system includes an inlet pipe or conduit 7 which delivers gas from the outlet of the exhaust manifold 3 to a catalytic type converter 9 which in turn discharges gas into a tailpipe 11 that conducts the treated gas to atmosphere. Within the catalytic converter 9, which may be of any desired construction, the undesired emissions in the exhaust gas that leave the engine undergo a chemical reaction and are converted to harmless constituents. The reaction within the converter 9 normally releases substantial quantities of heat and the temperature within the converter 9 becomes very high, in the vicinity of 1,500° to 1,600° F or higher, so that the gases that are discharged into the tailpipe 11 are very hot and the tailpipe itself becomes very hot. If these gases are permitted to flow the full length of the tailpipe and be discharged out of the tailpipe 11, it is possible that in some instances they may ignite readily

combustible material with which they come in contact, such as paper, dry grass, etc. Furthermore, the tailpipe 11, being constructed of metal, ordinarily low carbon steel, retains and conducts heat so that if inflamable material or heat destructible material comes in contact with it fire or damage can result.

In accordance with this invention, means are attached to the tailpipe 11 to form a shield or protective cover against inadvertent contact of the hot pipe 11 with objects that might be damaged by such contact. This means also serves to conduct heat away from the pipe and thereby cool the pipe to some degree as well as the gases within the pipe. In addition, the shield means acts to reflect heat away from areas where heat dissipation might cause severe problems. Also, the shield of the invention may be arranged to be a means for supporting the pipe 11.

Referring first to the shield arrangement of FIGS. 1 to 3, the exhaust system 7 is shown as having three different shield assemblies 13, 15, and 17. Each of these assemblies comprises curved metal plates forming an imperforate upper portion and a perforated lower portion. Thus, the assembly 13 has an imperforate upper portion 19 and a perforated lower portion 21. The assembly 15 has an imperforate upper portion 23 and a perforated lower portion 25. The assembly 17 has an imperforate upper portion 27 and a perforated lower portion 29. It will be understood that each of these sections is composed of metal for manufacturing purposes and the melting point is sufficiently high to withstand the temperatures to which they will be subjected. Thus, it is contemplated that the various shield members will be constructed of low carbon steel, as is the tailpipe 11, in the usual application. As seen best in FIG. 3, the upper portion 19 (as well as portions 23 and 27) and the lower portion 13 (as well as lower portions 25 and 29), are approximately semi-cylindrical in shape and arranged to be substantially coaxial with the tailpipe 11, the tailpipe being shown as a laminated or two layer construction. The upper section 19 is shown as fitting over the outside of the lower section 21, that is, it is larger in diameter by the thickness of the metal. Both the upper and lower sections of the various assemblies have dimples or indentations 33 formed in them which extend to a depth such that they contact the outer surface of the tailpipe 11 and serve to provide positive means for spacing the sections 19 and 21 (as well as the other sections) from the pipe. Thus, there is provided a substantial space 35 between the upper section and the tailpipe 11 and a space 37 between the lower section 21 and the tailpipe 11. While the assemblies 13, 15, and 17 may be actually spot-welded or welded to the pipe 11 in the bottoms of the various dimples 33, it is presently preferred to merely clamp them to the pipe and this can be done by any suitable commercial clamps such as illustrated at 39. The clamp 41 for the assembly 15 is also used as a means to attach the tailpipe 11 to the hanger element 43 which in turn is secured to the understructure of the vehicle as indicated at 45. Thus, the shield assembly 15 serves as a support element for the tailpipe 11 and is itself suspended by means of the hanger arrangement on the vehicle.

FIGS. 4 and 5 show a modified type of shield assembly in which a semi-circular upper imperforate plate element 103 fits inside a channel shaped lower plate element 105. The lower element is corrugated transversely of the axis of the pipe 11 as seen by the undula-

tions 107. The corrugations give more metal for cooling and also provide hot flow pipe support against sag. Though not shown, the upper element 103 could be corrugated or could have dimples corresponding to dimples 33 in contact with pipe 11. A clamp member 109 fits around the members 103 and 105 and is secured by a screw 111 to a hanger 113 which may be attached to the vehicle frame. As mentioned, the corrugations 107 provide support for the tailpipe 11 and also provide a substantial heat sink mass of metal for dissipation of exhaust heat. The clamp 109 on the outside of the shield assembly 101 supports the shield and the shield supports the pipe 111. The upper and lower halves may be two pieces or one piece, being shown as welded at their overlapped joint 115. The lower member 105 may be perforated, or it may be a screen, or it may be imperforate.

In each of the various forms, the space between the upper and lower members in the pipe 11 provides a substantial air gap and in instances where the opposite ends of either of the upper or lower members are open, air flow can take place along the length of the gap. The heat dissipating or radiating surface is increased by the areas of the shields and the air flow will serve to carry away heat from the system.

In the case of the assembly 15 (FIG. 1), the upstream ends of the members 23 and 25 are shown as necked down at 51 to close the opening at the upstream end. This will tend to prevent the assembly from collecting foreign matter during operation of the vehicle which might tend to work its way into and lodge in the passages 35 and 37. Either or both ends of a shield can be swaged down as indicated at 51 to suit anticipated road and use conditions. Also, the shields themselves can be of various different shapes to suit requirements of a particular installation.

The imperforate upper sections of the shields protect the underside of the vehicle and passenger compartment while the holes in the lower sections let hot air out in a downward direction. The lengths of the shields can vary, as illustrated, to suit the needs and the available space. The additional metal mass of the shields and their functioning as heat radiators serves to cool the pipe 11 and the gases inside the pipe so that gas temperature at the system exit can be expected to be reduced thereby lessening the danger of grass fires, etc.

Modifications in the structure shown can be made without departing from the spirit and scope of the invention.

I claim:

1. In a vehicle having an internal combustion engine with a catalytic exhaust system including a catalyst converter unit for reducing the quantity of unburned emissions in the exhaust gas, a pipe on the underside of the vehicle and connected to the converter to conduct exhaust gases away from the converter, an imperforate upper metal plate mounted adjacent the pipe and spaced from and above it to serve as a heat shield protecting the underside of the vehicle body, and at least one lower plate mounted adjacent the pipe and spaced from and below it, said lower plate being perforated.

2. A vehicle as set forth in claim 1 having an exhaust system wherein said plates have indentations formed therein and contacting the pipe and serving to space the plates from the pipe.

3. A vehicle as set forth in claim 2 having an exhaust system including clamp means for clamping the plates to the pipe.

4. A vehicle as set forth in claim 3 having an exhaust system wherein the upper and lower plates are concave with respect to the pipe and fit together so that the assembly of the two plates entirely surrounds a portion of the pipe.

5. A vehicle as set forth in claim 4 having an exhaust system including hanger means connected to the clamp means for supporting the pipe and plates on said vehicle.

6. A vehicle as set forth in claim 4 having an exhaust system wherein the lower plate is corrugated, the corrugations extending transversely to the length of the pipe and contacting the pipe to provide said indentations.

7. A vehicle as set forth in claim 2 having an exhaust system wherein the upstream ends of the plates are necked down into contact with the pipe to inhibit entry of foreign matter into the space between the plates and pipe.

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