United States Patent [19]

Fitts

[11] **3,888,081**

[45] **June 10, 1975**

[54] **EXHAUST MANIFOLD ASSEMBLY**

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[22] Filed: **Apr. 19, 1973**

[21] Appl. No.: **352,425**

[52] **U.S. Cl.** ..... **60/321**; 60/323; 123/52 M

[51] **Int. Cl.** **F01n 7/06**

[58] **Field of Search** ..... 60/274, 282, 323, 324, 60/321; 123/DIG. 1, DIG. 6, DIG. 7, 52 M, 52 MV; 181/40

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[57] **ABSTRACT**

A universal exhaust gas manifold comprises as a first part a "standardized" elongated exhaust gas receiver having a single longitudinally extending unobstructed entry port and as a second part a variably designed gas duct assembly whose only prescribed design parameter is that the bounding dimensions of its group of gas riser ports must fall within the outline of the receiver's entry port.

1 Claim, 6 Drawing Figures

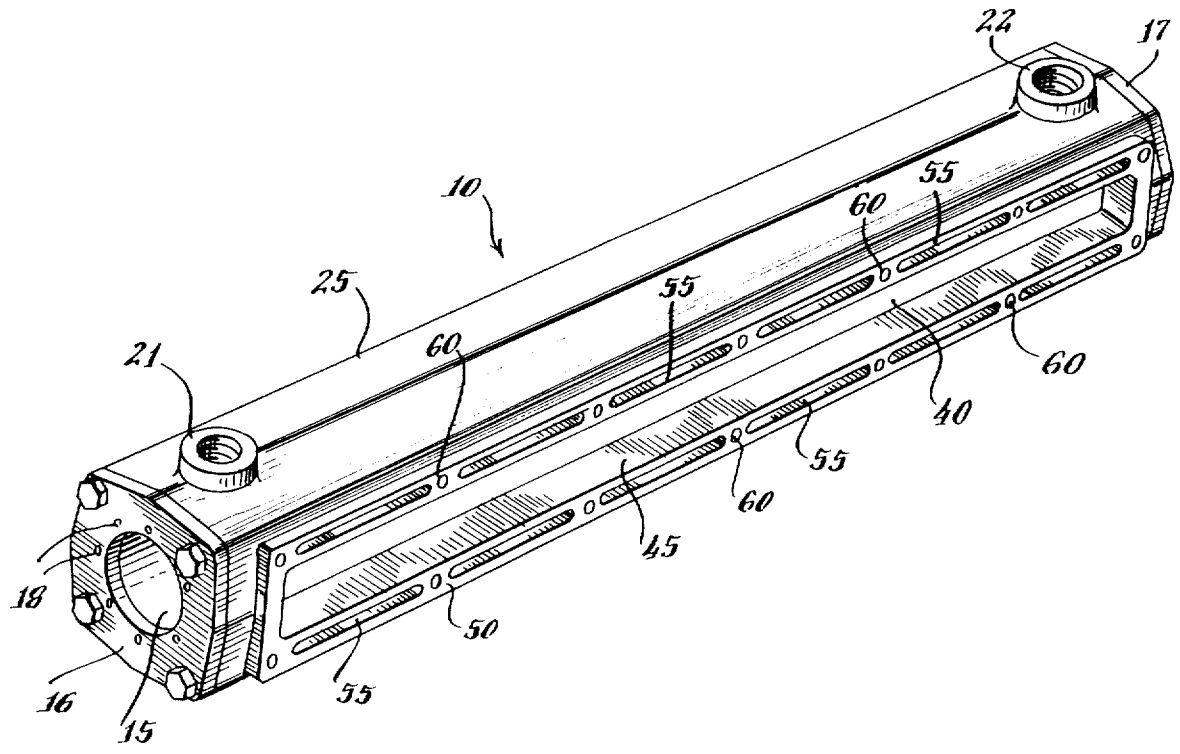


Fig. 1.

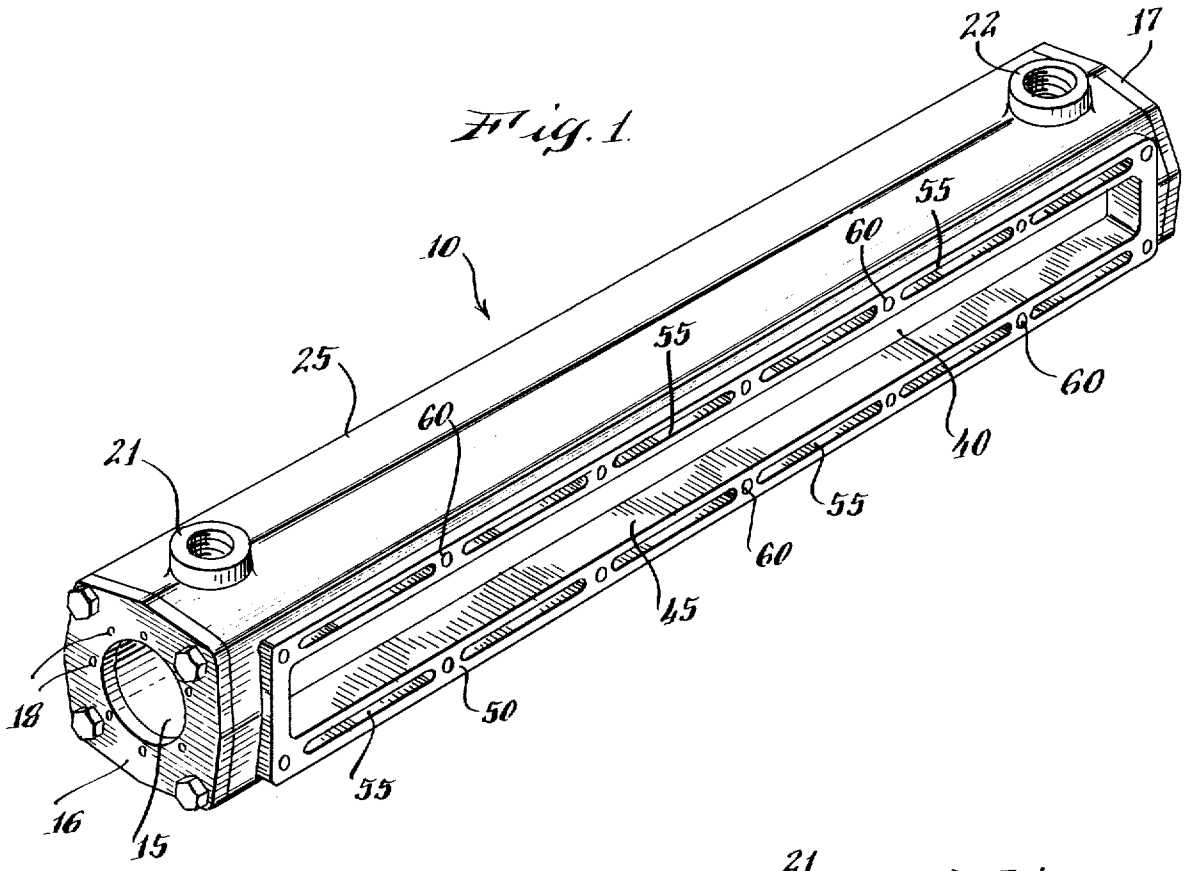

22
17
10
25
21
60
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50
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Fig. 2.

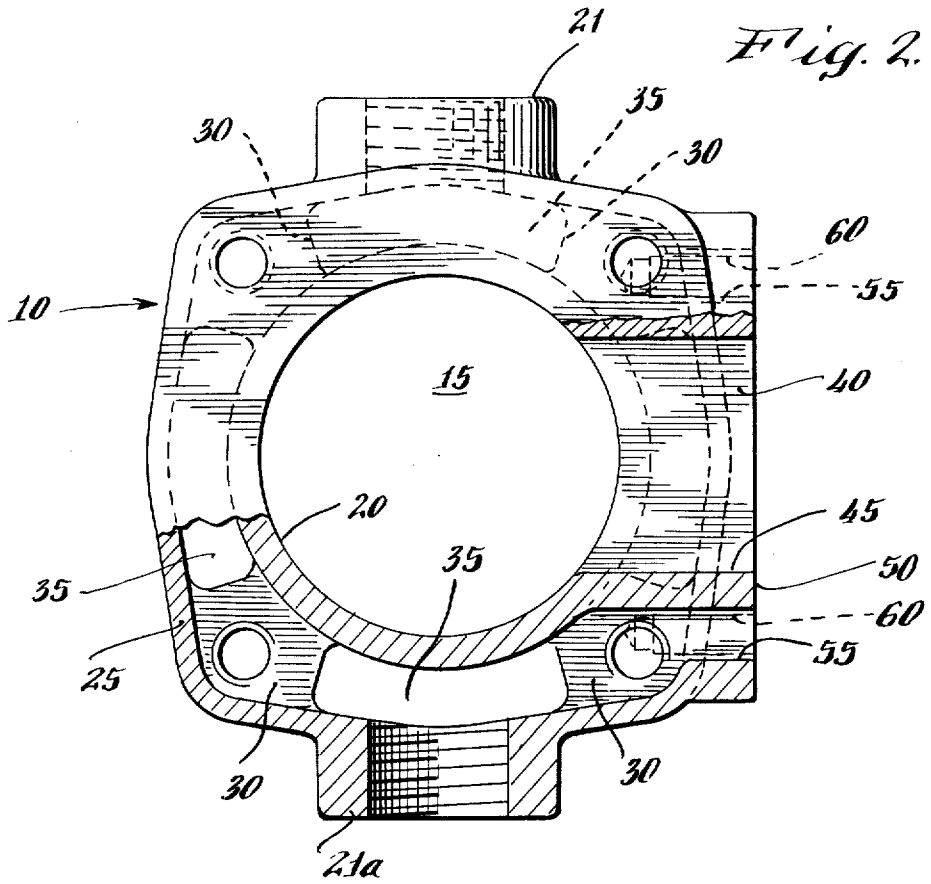

21
35
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25
21a

Fig. 3.

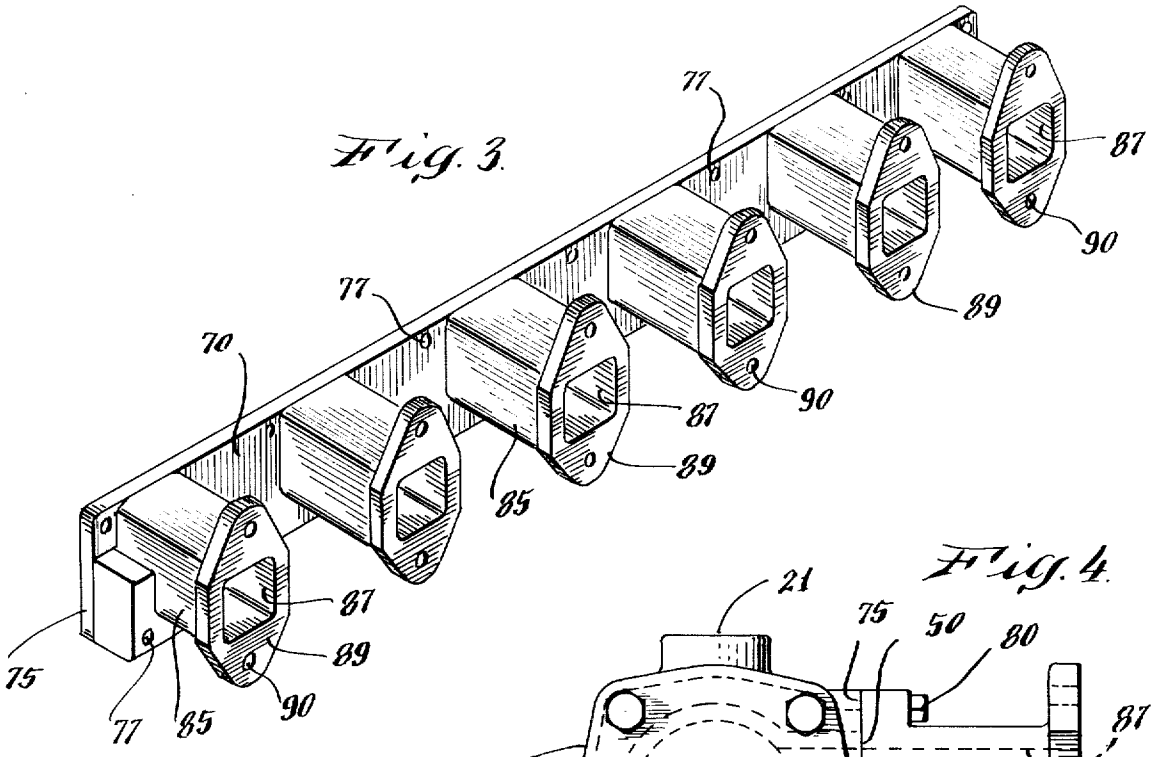


Fig. 4.

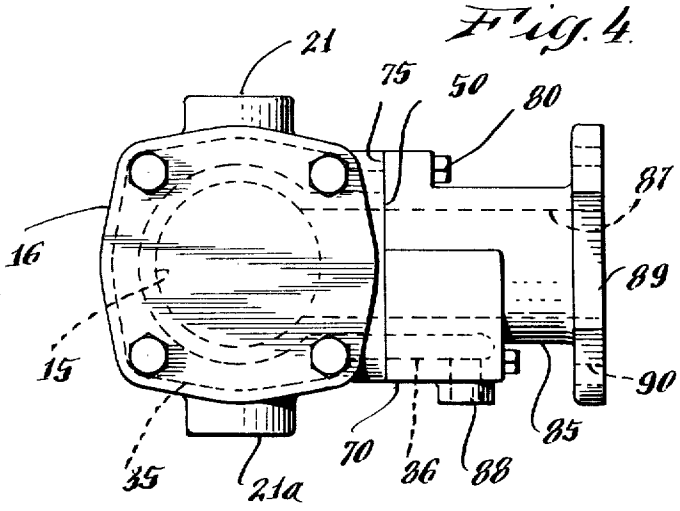


Fig. 5.

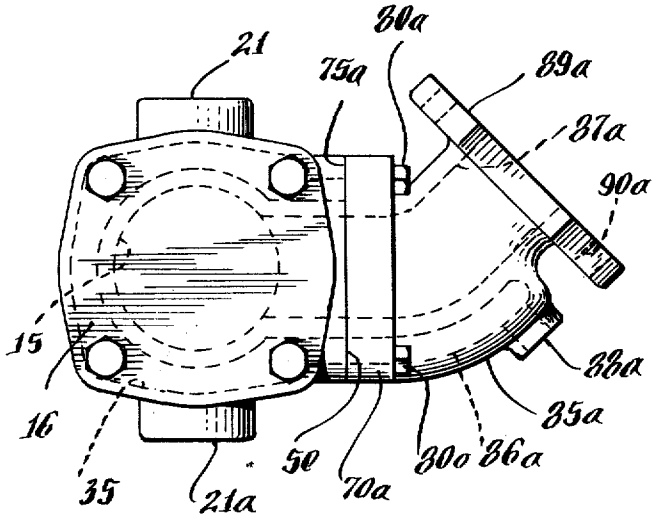
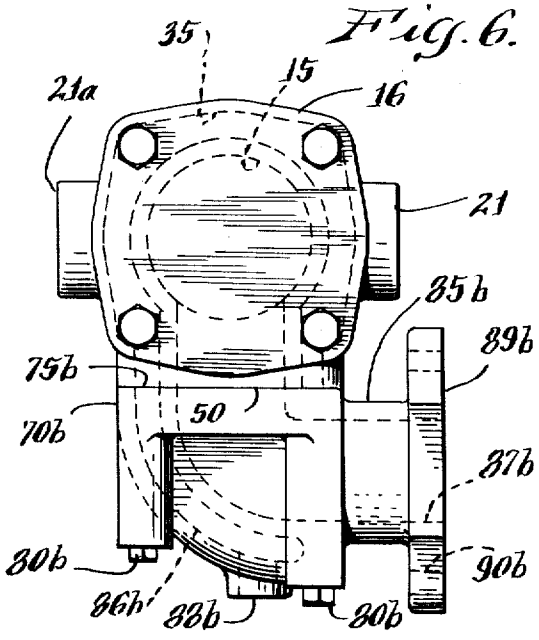


Fig. 6.



EXHAUST MANIFOLD ASSEMBLY

BACKGROUND AND BRIEF DESCRIPTION OF THE INVENTION

Exhaust manifold assemblies for internal combustion engines, either of the diesel or spark-fired variety, have conventionally been specially designed with a view to their application to a particular engine. Where that engine is intended for very large scale production, design and tooling expenses are spread over a large base and unit costs are therefore maintained at an acceptable level. However, the current proliferation of engine designs for special, although generally related, applications, leads to relatively high unit costs for all component parts. Because of their inherent complexity of structure, this high cost trend applies particularly to exhaust manifolds, and even more particularly to such liquid cooled manifolds as are provided for in-board marine engine installations.

In recognition of this problem, it is an object of the present invention to provide an improved exhaust manifold assembly which is capable of "universal" application in the sense that by modifying only a single detachable component of its structure it can be adapted for use with any one of a large variety of engine types. By this approach, even though the number of manifolds required for a single engine type may be small, the unit overall manifold cost can be kept within tolerable limits.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

In broad specification, the objects of the invention are achieved by use of a two-part manifold assembly, of which one part is a "standardized" exhaust gas receiver and the second part is a specially designed riser or duct assembly adapted to interconnect the standardized receiver with a selected one of a series of engines with which the receiver is intended to be used. A feature of the standardized gas receiver of the invention which makes it workable is the provision in the receiver of a single gas-receiving opening which, in the context to be described below, can interfit with a variety of duct assemblies having differing dimensional characteristics determined by the structural requirements of the engines to be served rather than being fixed once and for all by limitations imposed by their attachment to the receiver.

DETAILED DESCRIPTION OF THE INVENTION

Details of the structural features which illustrate the present invention will become apparent from the following description taken in connection with the accompanying drawings in which

FIG. **1** is a perspective view of the external aspects of the exhaust gas receiver of the present invention;

FIG. **2** is an end view of the gas receiver of FIG. **1** with its cover part removed to show essential elements of the internal structure of the receiver;

FIG. **3** is a perspective view of an exemplary duct assembly intended for use with the gas receiver of FIG. **1**;

FIG. **4** is an end view showing the intended mode of combination of the elements of FIGS. **1** and **4**; and

FIGS. **5** and **6** are views similar to FIG. **4** showing the combination of the gas receiver with alternatively constructed duct assemblies.

Referring particularly to FIG. **1**, this shows the external aspects of an exhaust gas receiver **10** of the type contemplated in the present invention. This is indicated as being of rectangular (e.g. square) cross-sectional configuration, although this is not essential to the purposes of the invention. The body of the receiver may be, for example, of cast iron formed by a conventional sand casting process and, indeed, is preferably of this construction for assurance of low unit cost. Essential internal details of the receiver are shown in FIG. **2**.

Referring to both FIGS. **1** and **2**, the gas receiving chamber of the structure **10** comprises a cylindrical space or cavity **15** which extends from end to end of the structure, being formed within a tube **20** produced in the casting process. The tube **20** is illustrated as being concentric with the outer frame **25** of the casting, although absolute concentricity is not essential for purposes of the invention. The tube is supported within the frame **25** by radially extending webs **30** formed in the casting process and integrally joining the outer surface of the tube with the body of the frame. These webs may exist only at the extremities of the tube and frame or may be otherwise disposed along the axial extent of the tube as may be required to produce a casting of adequate strength and rigidity. In any event, openings **35** exist between the various webs to permit longitudinal flow of cooling fluid no matter where the webs are located.

In accordance with the present invention the central chamber **15** is provided throughout a substantial part of its entire length with an opening **40** which extends to and through the outer surface of the wall of the casting frame **25.** This opening is, however, sealed from communication with the remaining internal space of the casing **25** by bounding walls **45** (FIG. **2**) which extend continuously from the interior enclosure **15** to the outer surface of the casing. In these circumstances it will be seen that the opening **40** provides substantially unobstructed communication between the exterior of the exhaust receiver **10** and the internal cavity **15** throughout a major portion of the cavity's length.

As a further aspect of my invention the external area of the casing **25** which surrounds the opening **40** comprises a "joining surface" **50** which, like the tubular enclosure **20** and the opening **40,** extends over a substantial part of the entire length of the exhaust receiver **10.** For purposes to be described in due course, the surface **50** also has a series of circumferentially extending elongated openings **55** which, as appears in FIG. **2,** penetrate to the space within the gas receiver casing **25** which surrounds the tubular structure **20.** Still further, the surface **50** is provided with a series of tapped holes **60** which may be used for a securing purpose to be mentioned very shortly below.

As has been indicated in the general description of the present invention, the "universal" exhaust gas receiver so far described is intended to be used in assembly with any one of a variety of differing duct assemblies designed to convey exhaust gases from the several cylinders of an internal combustion engine to a receiver. An example of such a duct assembly is illustrated in FIG. **3** and is shown as comprising a face plate **70** which, as is suggested by its outline, has a joining surface **75** that conforms generally to the joining surface **50** of the gas receiver. Plate **70** is provided with bolt holes **77** through which may be inserted bolts **80** which extend into the tapped holes **60** for securing the

plate **70** to the receiver **10** in gas-tight assembly as indicated in FIG. **4.** The face plate **70** is associated (e.g. by single unit casting) with exhaust ducts **85** having central openings **87** which, in the assembly of FIG. **4** may be assumed to communicate directly with the elongated opening **40** of the gas receiver **10.** Each of the ducts **85** is provided with a terminal flange **89** having bolt holes **90** by which it may be appropriately connected to the exhaust outlet of one of the cylinders of an internal combustion engine.

It is a primary advantage of the present invention that the exhaust gas receiver **10** may be connected to duct assemblies which differ in various respects from the assembly of FIG. **3,** depending on the manner in which the exhaust manifold as a whole is to be associated with the internal combustion engine which it serves. For example, FIGS. **5** and **6** of the drawings show exemplary shapes **85***a* and **85***b* which the interconnecting gas ducts may assume as alternatives to the straight thrust arrangement of FIGS. **3** and **4.** It should also be understood that the number and longitudinal spacing of the ducts along the axis of the face plate **75** may be varied with substantial tolerance, provided only that the aggregate extension of the gas outlets in the direction of their alignment is less than the correspondingly oriented extension of the opening **40,** and even though the precise location of such outlets within the limits of such extension is unpredictable at the time the "standardized" gas receiver is produced.

Referring once again to FIG. **1,** it is to be understood further that since the two extremities of the casting **10** are of identical configuration, considerable flexibility exists as to the arrangements to be made for discharge of gas from the central cavity **15.** For example, in connection with the arrangement shown in FIG. **1** it may be assumed that the right hand extremity of the casting is sealed in gas-tight fashion by the application of a solid cover plate **17,** and that a gas exhaust pipe (not shown) is to be bolted to the left hand end by affixing it to the cover plate **16** by use of the illustrated ring of tapped securing holes **18.** Alternatively, for some uses, similar exhaust pipes may be attached to both ends of the exhaust gas receiver.

Where, as in the case of the particular exhaust gas receiver so far described, cooling of the receiver by means of a circulated fluid (e.g. water) is intended, such fluid may be introduced into and withdrawn from the interior of the casting **10** in the region surrounding the tube **20** by means of appropriate openings **21, 21***a* and **22** located near the extremities of the casting. Two each of these openings, **21, 22** are cast into the gas receiver at each end for convenience, and one or more of them may be plugged when not required, depending upon the orientation of the gas receiver. The cooling fluid so circulated will extract heat from the tube **20,** the outer walls of the casting **10,** and also from the face plate **70** and the ducts **85** through openings **55** and communicating passage **86.** A drain plug **88** in connection with passage **86** may be provided on the ducts as shown in FIGS. **4, 5** and **6.**

While the invention has been described by reference to a particular embodiment, the following claims are intended to cover all variations and equivalents which are within the true spirit and scope of the invention. Thus, while the opening **40** of FIG. **1** has been shown as wholly free from obstruction, the presence of minor supporting webs or the like within or in the vicinity of the opening would not represent departure from the invention as long as substantially unobstructed communication is maintained with the cavity throughout the major portion of its length.

The exhaust gas manifold of the present invention is economical to manufacture because of the universal nature of the gas receiver portion, i.e., the standard gas receiver can be adapted to many face plates which accommodate different types of engines. The manifold of the present invention is less complex and less expensive to cast than a one piece manifold. Further, it is relatively easy to clean since removal of the face plate facilitates cleaning of both the water jacket and the interior of the receiver.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A universal exhaust gas manifold assembly comprising:

A. an exhaust duct assembly comprising,
  1. a face plate having a joining surface,
  2. a plurality of gas ducts on the side opposite said face plate joining surface and
  3. means forming openings in said face plate from said gas ducts, and

B. an elongated cast metal gas receiver having
  1. an internal cavity extending lengthwise thereof for receiving exhaust gases,
  2. a joining surface extending along the side of said receiver and conforming to said face plate joining surface
    i. said surface having means forming at least one longitudinal opening therein which is in communication with said cavity, and
    ii. which is aligned to receive gas from two or more of said gas ducts,

whereby said gas receiver may be connected to any one of a number of face plates having varying gas duct locations along the face plate for different internal combustion engine configurations; and

  3. means forming a cooling jacket cast around said gas receiver internal cavity, said cooling jacket having a plurality of openings on said gas receiver joining surface through which cooling fluid is brought in contact with said face plate joining surface when said face plate is joined to said gas receiver.

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