April 21, 1953 C. B. LEACH 2,635,418

MANIFOLD MOUNTING

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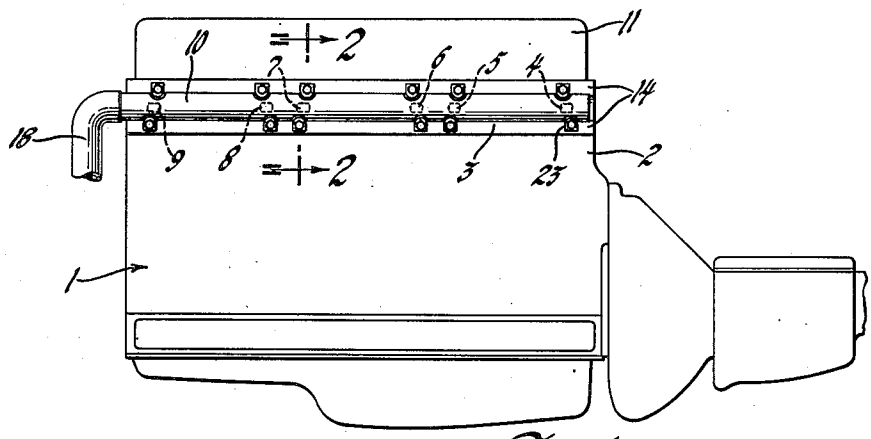


Fig. 1

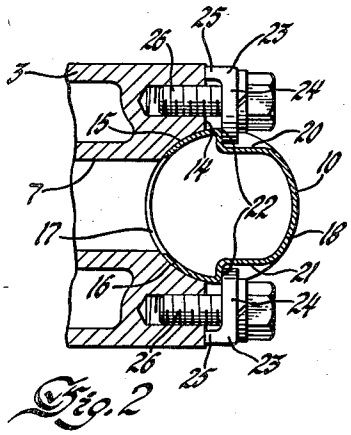


Fig. 2

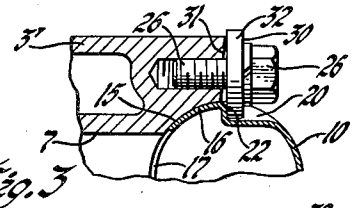


Fig. 3

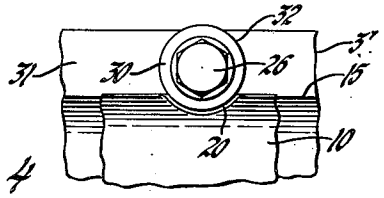


Fig. 4

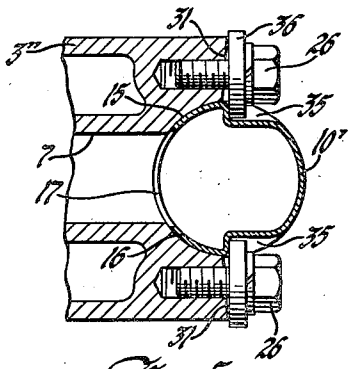


Fig. 5

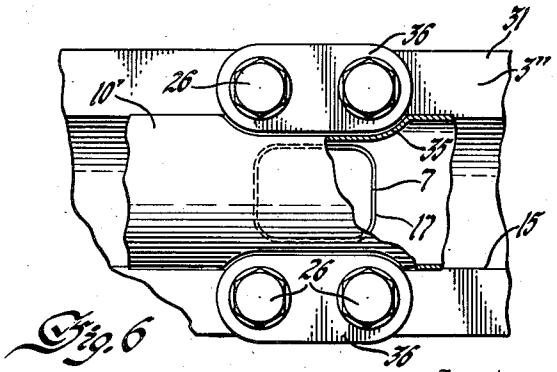


Fig. 6

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MANIFOLD MOUNTING

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This invention relates to exhaust manifolds for internal combustion engines and the like, and particularly to means for clamping a tubular manifold to the cylinder head or other structure containing the exhaust ports.

The invention concerns primarily, though not exclusively, an improved clamping arrangement for manifolds made of seamless or welded steel tubing. In the use of such a manifold which is generally circular in cross section, it is preferable that the side or wall of the manifold containing openings in registry with the cylinder head exhaust ports be socketed or recessed in the ported side of the cylinder head, thereby obtaining a satisfactorily tight seal around the exhaust ports without the necessity of providing a separate gasket between the manifold and cylinder head.

A problem has existed in the use of these types of manifolds in obtaining a proper clamping arrangement which will hold the manifold tightly in place under all operating conditions and which is unaffected by changes in temperature of the manifold. The use of plain strap or U-type clamps engaging the exposed portion of the manifold have been found less than satisfactory due to the fact that when the exposed portion of the tube becomes red-hot in operation it tends to collapse a certain amount under the pressure of the clamp, resulting in a subsequently loose mounting of the manifold.

As the result of a study I have made to correct this difficulty, I discovered that the inner portion of the manifold tube in contact with the cylinder head remains relatively cool during engine operation as contrasted with the outer portion of the tube which becomes excessively hot. From this finding it was reasoned that if a clamping area could be designed which confined the clamping pressure to the inner portion of the tube, the heating up of the outer portion in operation would not affect the tightness of fit of the manifold on the cylinder head.

Accordingly, it is the prime object of my invention to provide an improved arrangement for clamping a tubular exhaust manifold to the exhaust port structure of an internal combustion engine or the like.

A further object of my invention is to provide tubular exhaust manifold clamping means which is not subject to manifold temperature changes in operation.

A still further object of my invention is to provide an improved clamping arrangement for tubular exhaust manifolds wherein the clamping

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pressure is applied solely to the relatively cool operating portions of the manifold.

Other objects and advantages of this invention will be apparent from the following description, having reference to the drawing wherein:

Figure 1 is a side elevational view of a conventional internal combustion engine incorporating my improved exhaust manifold clamping means.

Figure 2 is an enlarged sectional view of the cylinder head with the manifold in place, taken substantially on line 2—2 of Figure 1.

Figure 3 is a fragmentary view similar to Figure 2, showing a modified form of my clamping means.

Figure 4 is a fragmentary view in side elevation of the form of my invention shown in Figure 3.

Figure 5 is a view similar to Figure 2 but showing still another modification of my improved clamping means.

Figure 6 is a fragmentary view in side elevation showing the form of clamping means of Figure 5.

Referring now to the drawing illustrating my invention, I have shown the same applied, for example, to an overhead valve type internal combustion engine designated generally by the numeral 1. As shown in Figure 1, the engine includes a conventional crankcase and cylinder block structure 2 on which is a cylinder head 3 forming the usual combustion chambers (not shown) above the engine cylinders and having side openings or ports 4, 5, 6, 7, 8 and 9 leading outward from the chambers to the exhaust manifold 10. 11 represents the usual cover enclosing the rockers and lubrication system for the valves located in the cylinder head 3.

As will be seen in Figure 2, the side face 14 of the cylinder head 3 is cylindrically recessed as at 15 to socketably receive the inner side wall portion 16 of the generally cylindrically shaped manifold 10, this recess extending the full length of the cylinder head and in line with the ports 4–9. Opposite and in registry with each of these ports is an opening 17 in the wall 16 of the manifold through which the gases are introduced into the manifold for conduction longitudinally therethrough to an exhaust outlet pipe 18. At spaced points along the manifold 10, and preferably approximately opposite the openings 17, are formed indentations 20 and 21 adjacent both sides of the recess 15. These indentations which may be formed by any suitable swaging operation on the manifold provide abutment surfaces 22 which are

substantially parallel with the side face 14 of the cylinder head and spaced outwardly only a short distance therefrom. The face 14 provides cooperating abutment surfaces for lugs 23 which serve to hold the manifold 10 tightly against the recess 15. These lugs in the form shown in Figure 2 are generally of L-section having legs 24 overlying the abutment surfaces 22 and legs 25 at right angles thereto which engage endwise with the cylinder head face 14. Studs or bolts 26 threadedly engaging the cylinder head 3 are provided which pass through the legs 24 and serve to hold the parts in assembled relation.

As will be apparent, since the inner wall portion 16 of the manifold 10 is in close engagement with the large mass of the cylinder head 3, it will tend to remain at relatively low temperatures during engine operation. Further, since the clamping pressure of the lugs 23 is applied to the manifold only at the abutment surfaces 22 which are in close proximity to the relatively cool portion 16 of the manifold, excessive heat and resultant softening of the outer wall portion 18 of the manifold will not affect the tightness of the clamping pressure. By the use of the L-section lugs 23 a leverage effect is produced as the bolts 26 are drawn up on the legs 24, the fulcrum of the lever action being located at the inner ends of the legs 25.

Instead of using L-section lugs 23 as shown in Figure 2, plain flat washers 30 may be substituted as shown in Figures 3 and 4. To provide a similar lever action by the lugs 30 a cylinder head 3' has been modified to provide inclined lug abutment surfaces 31 on each side of the recess 15. These abutment surfaces 31 incline parallel to the tubular axis of the manifold and toward the exhaust ports 4–9, the inner extremities of these surfaces being spaced a slight distance inwardly of the cylinder head from the abutment surfaces 22 provided on the manifold. When the bolts 26 are drawn up, the lugs 30 tend to fulcrum about their outer ends 32 on the cylinder head, thereby applying an adjustable clamping pressure against the manifold surfaces 22.

In Figures 5 and 6 I have employed the same inclined abutment surfaces 31 on the cylinder head 3'' but have modified the lugs to provide for clamping each of them with two bolts 26 instead of one. The indentations 35 in the manifold 10' are elongated longitudinally of the latter to accommodate the elongated lugs 36 as will be clear from Figure 6.

The location of the indentations and lugs longitudinally of the manifold may be selected as desired, although it is preferable that they be placed opposite or substantially opposite the exhaust ports. Two such arrangements shown, are in Figure 1 wherein the lugs are located in oppositely offset relation to each port, and in Figure 6 wherein the lugs 36 are located directly adjacent opposite sides of the ports.

I claim:

1. In a multi-cylinder internal combustion engine or the like, structure forming ports for the passage of exhaust gases outwardly from the engine cylinders, an exhaust manifold for conducting the gases from the outer ends of said ports toward one end of the engine, said manifold being of tubular formation with one side adapted for close mating engagement with the external surface of said structure, said side being formed with openings in registry with said ports, indentations formed in the surface of the manifold closely adjacent said external surface, and clamping means engaging said indentations and secured to said structure.

2. In a multi-cylinder internal combustion engine or the like, a cylinder head having exhaust ports in communication with the engine cylinders, the external surface of said head adjacent and between said ports forming a generally cylindrical recess, a tubular manifold socketed in said recess and provided with side openings in registry with said ports, opposite walls of said manifold outwardly adjacent said recess being provided with indentations, lugs engaging said indentations, and members clamping said lugs to the cylinder head.

3. In an internal combustion engine or the like, structure defining a plurality of cylinder exhaust ports in spaced relation longitudinally of the engine, the external surface of said structure between and adjacent said ports being recessed to socketably receive one side of a tubular manifold, a tubular manifold socketed in said recess and having side wall openings in registry with said ports, seats on the external surface of said manifold outwardly adjacent said recess, clamping means for urging the manifold tightly against said structure including lugs with bolts extending therethrough and into said structure, said lugs being in abutment with said seats and structure on opposite sides only of their respective bolts.

4. In an internal combustion engine or the like, structure defining a plurality of cylinder exhaust ports in spaced relation longitudinally of the engine, a tubular manifold having a side wall recessed within said structure and provided with apertures in registry with said ports, indentations in the periphery of the manifold forming lug abutment surfaces adjacent said structure on opposite sides of said ports, lugs engaging said abutment surfaces, and members securing the lugs to said structure, said structure being provided with lug abutment surfaces parallel with the tubular axis of the manifold and inclining away from the lugs toward said manifold side wall.

5. In an internal combustion engine or the like, structure defining a plurality of cylinder exhaust ports in spaced relation longitudinally of the engine, a tubular manifold having a side wall recessed within said structure and provided with apertures in registry with said ports, indentations in the periphery of the manifold forming lug abutment surfaces adjacent said structure on opposite sides of said ports, other lug abutment surfaces on said structure adjacent said indentations, L-section lugs each having a first leg engaging an abutment surface on said manifold and a second leg engaging the adjacent abutment surface on said structure, and members extending through said first legs and threadedly anchored in the structure for clamping the manifold in place.

6. In an internal combustion engine or the like, structure defining a plurality of exhaust ports in spaced apart relation along one side of the engine, a tubular manifold with one side in close mating engagement with the external surface of said structure, said last named side being provided with wall openings in registry with said ports, seats provided on the external surface of the manifold closely adjacent said last named side, and members clampingly engaging said seats and secured to said structure.

7. In an external manifold for connecting a plurality of exhaust ports spaced along one side

of an engine, said manifold being tubular in section with one side wall of the tube adapted to closely mate with the external surface of the engine surrounding said ports and provided with openings adapted to register with said ports, seats provided on the external surface of the tube for engagement by clamping means secured to the engine, said seats being located on portions of the tube's external surface closely adjacent said side wall.

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