

[54] **FUEL INJECTOR MANIFOLD AND MOUNTING ARRANGEMENT**

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abandoned.

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123/139 AW, 239/550

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[58] Field of Search 123/32 AE, 32 EA,
123/148 A, 32 V, 139 AW, 32 E, 119 R, 32
SU, 32 F, 32 G, 32 H, 32 R, 52 M; 285/345;
239/550, 551

References Cited

UNITED STATES PATENTS

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FOREIGN PATENTS OR APPLICATIONS

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Primary Examiner—Wendell E. Burns

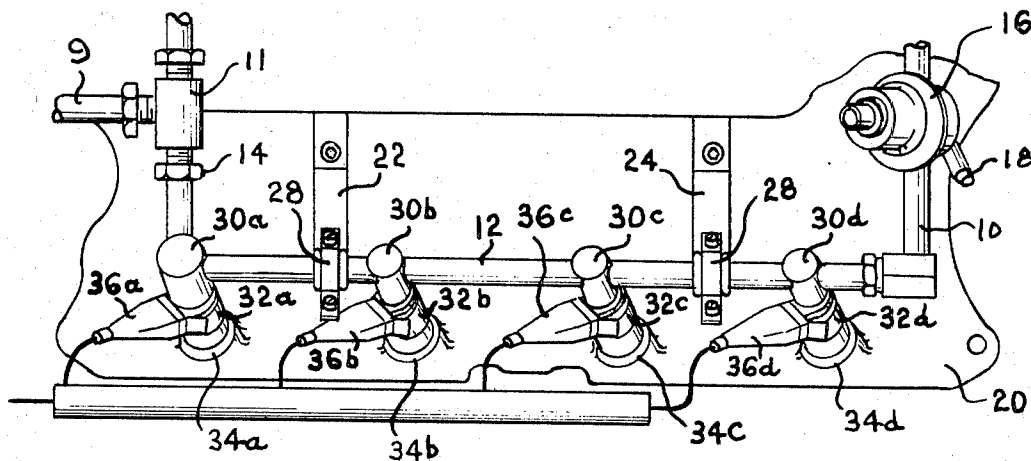
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ABSTRACT

A liquid injector manifold and mounting arrangement wherein the fuel injector is supported in the engine at one end in a cylindrical bore with the aid of a circular seal. The injector extends from the engine and is supported at its other end by an extending fitting which tees off from a tubular common rail liquid fuel manifold. The tubular liquid fuel manifold is supported by brackets at a raised elevation. The connection between manifold fitting and fuel injector also employs a cylindrical surface and circular seal connection.

1 Claim, 5 Drawing Figures



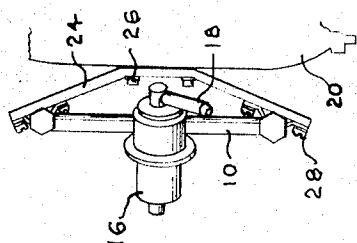


FIGURE 3

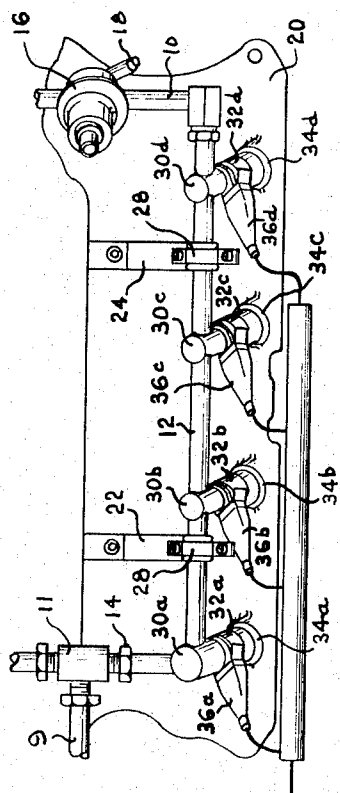


FIGURE 1

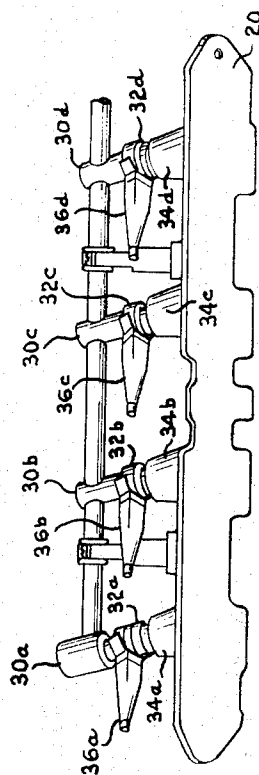


FIGURE 2

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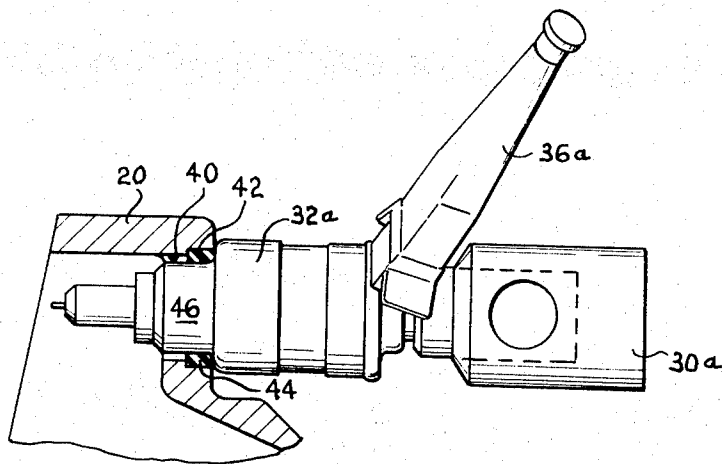


FIGURE 4

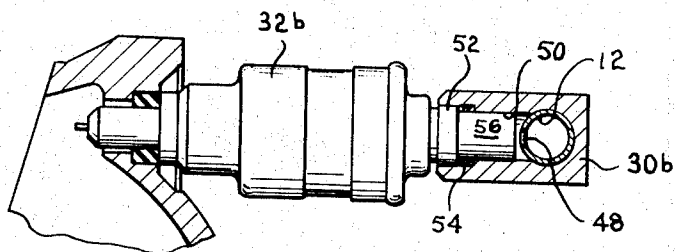


FIGURE 5

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FUEL INJECTOR MANIFOLD AND MOUNTING ARRANGEMENT

This is a continuation, division, of application Ser. No. 181,680, filed Sept. 20, 1971 now abandoned.

BACKGROUND OF THE INVENTION

Liquid fuel injection systems are receiving increasing acceptance because of the need for more accurate fuel handling systems to combat excessive exhaust emissions. Unfortunately, fuel injection systems are complex and expensive, particularly multiple point injection systems where injection occurs adjacent each engine cylinder or subgrouping of cylinders. Another problem has been to dissipate heat in and around the injectors to reduce consequent fuel vaporization which leads to loss of metering accuracy.

DESCRIPTION OF THE PRIOR ART

Perhaps the most common prior art approach to injector mounting is to simply form a boss on the engine block or air intake manifold for each injector location, drill and thread the boss, and form complementary threads on the injector housing. Thus, the injector is securely mounted and entirely supported at one end, as illustrated in prior U. S. Pat. No. 2,980,090. The injector may be partly recessed and arranged to receive fuel from passages partly formed in the block as illustrated in U. S. Pat. No. 3,247,833. In prior practice, the liquid fuel manifold does not substantially assist in supporting the injectors.

SUMMARY OF THE INVENTION

In the present invention the liquid fuel manifold is utilized as a support member at one end of the injector valve, giving the required structural support without the necessity of expensive pockets or passages or thread-forming operations. Moreover, by the use of circular seals on cylindrical surfaces at the connection points at either end of the injector, mating tolerances along the injector valve axis are considerably relaxed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a common fuel rail injector valve installation as it might appear for one bank of a V-8 engine;

FIG. 2 is a side view of the installation of FIG. 1;

FIG. 3 is an end view of the installation of FIG. 1 showing particularly in detail the support bracket for common injector fuel rail; and

FIGS. 4 and 5 illustrate two configurations of injector mounting detail.

DETAILED DESCRIPTION OF THE DRAWINGS

The drawings illustrate a common rail liquid fuel distribution injection system which is particularly arranged to provide good support for the injectors by means of a mounting technique which can be easily manufactured in mass production with very low tolerance requirements.

The common fuel rail or manifold consists of interconnected passages 10, 12, and 14 which receive fuel through tee connection 11 from a fuel inlet 9. A fuel return passage 18 is normally provided, leading back to the fuel tank (not shown) from fuel pressure control valve 16.

A portion of the engine in the embodiment of FIGS. 1-3 is designated by numeral 20 which is representative

of that portion of the engine where it is desired to mount the injectors. This may be either the engine block per se, cylinder head(s), or a portion of the air intake manifold, depending on engine and manifold design and desired point of injection. A pair of wing-shaped brackets 22 and 24, best shown in FIG. 3, are affixed by studs 26 to the top of engine portion 20 to provide rigid fixed support members for the fuel rail. Horseshoe straps 28 secure fuel rail passage 12 to the ends of the support brackets at a point of raised elevation above the engine. A plurality of fittings 30a, 30b, 30c, and 30d are secured to fuel rail passage 12 at spaced locations and each receives the top end of a respective injector 32a, 32b, 32c, and 32d. The injectors may be of several well-known types of electromechanical injector valves, two configurations of which are illustrated in the referred to prior patents. The lower ends of the injector valves are received in the raised bosses 34a, 34b, 34c and 34d formed in the engine block or manifold 20. Each injector also has an electrical connector 36a, 36b, 36c and 36d respectively to supply the energizing electrical energy to selectively open the injectors at desired intervals.

Referring to FIGS. 4 and 5, two configurations illustrating the injector support connections are shown. In the FIG. 4 arrangement, the injector 32a is received in cylindrical bore 40 formed in the engine portion 20 which bore contains a seal groove 42 which receives elastic or deformable circular seal 44. On its inner diameter seal 44 cooperates with a large diameter cylindrical surface 46 formed on the injector housing which permits the injector to project well through the engine wall. The elastic seal on cylindrical surface permits tolerances to be relaxed in both the radial and axial directions. The seal will, of course, deform to compensate for radial deviations in dimensions or concentricity and is capable of sealing along a considerable length of cylindrical surface 46 of the injector to accept wide deviations in an axial sense.

FIG. 5 shows most clearly the connection between the other end of the injector and fitting 30b. Fitting 30b is secured to fuel rail 12 by brazing or the like. A hole 48 is drilled through the side wall of tube 12 to permit fuel to flow into the cylindrical bore 50 formed in the fitting. A seal groove 52 receives an elastic and deformable circular seal 54. Seal 54 cooperates with the cylindrical surface 56 formed on the injector end to accept both radial and axial tolerance variations in the manner previously described and perform a liquid-to-air sealing function.

Referring to FIGS. 1 and 2, it will be noted that each fitting 30 is a spaced distance away from the points of connection of the fuel rail to rigid supports 22 and 24. The fuel rail may be of simple metal tubular construction or equivalent materials and configuration to permit some deflection or bending transversely to the axis of the fuel rail. Thus, the fitting may be utilized to provide an axial seating load to the injector housing and may be displaced by bending the fuel rail to accept further tolerance variations and facilitate injector assembly and/or replacement. While an axial seating load has some locating advantages, it is not essential to the practice of the invention since sealing at both ends is accomplished by radial compression of the deformable seals 54 and 42.

The described mounting arrangement is well suited to mass production manufacture at low cost since sim-

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ple, easy to machine, cylindrical surfaces are utilized at the attachment points and elastic seals, which permits manufacturing tolerances to be considerably relaxed. The use of the fuel rail as an injector support device utilizes existing structure to perform an additional function with virtually no increase in cost, but merely by means of judicious arrangement. The injectors are mounted to project well out of the engine block and need not be recessed therein to provide good ventilation while still having durable two-point support.

I claim:

- 1. A fuel injector mounting arrangement for an engine comprising:
 - a tubular common fuel rail for maintaining an available standby source of fuel;
 - a rigid bracket member connected to said fuel rail

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and adapted to be fixedly attached to an engine to provide support at a location along the fuel rail; at least one fitting connected to said fuel rail a spaced distance from the location of support provided by said bracket member; and an injector valve assembly having connections at each end with said fitting and the engine to provide two-point support at spaced distances along the length of the injector valve, each said end connections having its respective interfitting cylindrical surfaces aligned along the longitudinal axis of the injector valve assembly and each end connection arranged to confine movement of the injector valve assembly in one direction while permitting slidable movement in the opposite direction along said axis.

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