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(54) Inlet manifold and fuel supply assembly.

(57) An inlet manifold (13) is formed from two castings (14, 15) joined along an interface (16), one casting (14) defines a plurality of seat formations (19) each seat formation (19) being adapted to locate a fuel injector (21), the seat formations (19) opening at one end into an associated inlet passage (17), the other casting (15) defining closure formations (20) corresponding to the seat formations (19) so that when the two castings are bolted together the closure formations (20) will retain the fuel injectors (21) in the seat formations (19), a common fuel passage (25) being provided in the manifold (13) and communicating with each of the seat formations (19) for supplying fuel to the fuel injectors (21).

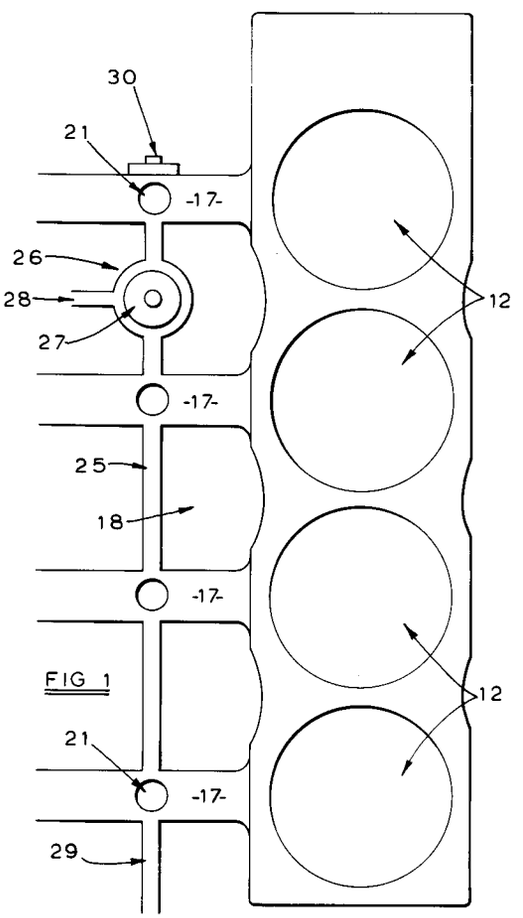

FIG 1

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The invention relates to a combined inlet manifold and fuel supply assembly for a fuel injection internal combustion engine incorporating a plurality cylinders in a single bank with a common manifold.

A typical inlet manifold and fuel supply assembly for an internal combustion engine incorporates a separate air inlet leading to each cylinder and a separate fuel injector for each air inlet arranged to inject fuel in metered quantities into the inlet as required. One known way of positioning the fuel injectors is to mount them in a fuel rail and then mount the fuel rail and injectors as a single unit on a manifold.

The fuel rail typically has an inlet leading from a fuel tank via a pump, a return feed to the fuel tank via a pressure regulator and individual connections to the injectors in the manifold.

An object of the invention is to provide a simplified inlet manifold and fuel supply assembly.

According to the present invention there is provided an inlet manifold and fuel supply assembly for a fuel injection internal combustion engine incorporating a plurality of cylinders in a single bank with a common inlet manifold for the bank of cylinders characterised in that the manifold is formed in two parts joined along an interface extending longitudinally of the bank of cylinders, one part of the manifold defining a plurality of seat formations, each seat formation being adapted to receive a fuel injector, the seat formations opening at one end into an associated inlet passage, closure formations corresponding to each seat formation being provided on the other part of the manifold to retain the fuel injectors in their seat formations and a common fuel passage within the manifold, said common fuel passage communicating with each of the seat formations for supplying fuel to the fuel injectors.

In this way, a separate fuel rail is no longer required, thus reducing the number of components in the assembly and the number of separate fuel connections. In general, reducing numbers of components makes it possible to reduce cost and improve reliability.

Preferably an electrical connector rail is provided in the manifold to automatically make required electrical connections to the injectors on assembly of the manifold. This obviates the requirement for a separate external harness for the fuel rail and/or manifold.

Preferably a pressure relief valve is also provided in a chamber defined by the two parts of the manifold.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic plan view of part of an engine incorporating part of a manifold with relative positions of some parts altered for clarity of illustration, and

Figure 2 is a cross section on a larger scale through one cylinder and the associated injector showing additional components.

Figure 1 is a very diagrammatic representation of the layout of a spark ignition four cylinder reciprocatory internal combustion engine with one bank of four cylinders. The engine itself, apart from the fuel supply system, is represented by a cylinder block and head 11 with four cylinders 12 in a common bank. An inlet manifold 13 is arranged to provide a fuel-air mixture to the cylinders for combustion.

Figure 2 shows that the manifold 13 is divided into two parts 14 and 15 along an interface 16. Typically, both parts 14 and 15 are aluminium castings with machined faces at the interface and with other machining where required. The manifold provides four separate inlet passages 17, one leading to each cylinder. Alternatively plastic mouldings may be used for the manifold. The material bounding these passages may be joined by webs 18 forming part of a common casting. Four seat formations 19, one corresponding to each of the inlet passages 17 are provided in the lower part 14 of manifold 13 for receipt of fuel injectors 21. The seat formations 19 open at one end into the associated inlet passage 17. The injectors 21 are located in position in the seat formation 19 by a flange 22 which engages in a spigot 23 formed at the end of the seat formation 19 adjacent interface 16. Part 15 of the manifold 13 defines four closure formations 20, each closure formation 20 corresponding to one of the seat formations 19, so that when the two parts 14, 15 of the manifold 13 are bolted together, the closure formations 20 will clamp flange 22 in spigot 23 to retain the injector 21 in seat formation 19. The injectors 21 are thereby totally enclosed within the manifold 13.

The injectors are controlled electrically by signals supplied separately to each injector by an electrical connector rail 24 fixed in a longitudinal groove in the casting 15 and opening to each of the closure formations 20. The connector rail 24 is arranged to automatically make the required connections to the injectors on assembly of the two parts 14, 15 of the manifold 13. The electrical connector rail 24 terminates in a multi-pin connector 30 from which electrical signals are supplied to operate the injectors 21.

A longitudinal fuel passage 25 communicates with all four seat formations 19 within the casting 14 and thus provides a common fuel supply equivalent to a fuel rail for all four injectors. Fuel is supplied to the passage 25 from the fuel tank via a pump (not shown) to an inlet 29. As seen in Figure 1, a chamber 26 is formed by the parts 14, 15 of

manifold 13 between two adjacent seat formations 19 and their associated injectors 21 and this chamber carries a pressure relief valve 27. A return pipe 28 leads from a downstream region of chamber 26 to the fuel tank. Fuel is retained in the rail by two seals 33 on each injector 21 and similar seals on the pressure relief valve 27. A further seal 34 seals the interface 16.

In order to assemble the complete inlet manifold and fuel supply assembly from individual finished components, the connector rail assembly 24 is first inserted in casting 15 along with the multi-pin connector 30. The individual injectors 21 are then inserted in the seat formations 19 and located in their required positions by their flanges 22 in spigots 23. Pressure relief valve 27 is similarly positioned within chamber 26. The upper casting 15 is then brought into engagement with the lower casting 14 and the electrical connections to the injectors 21 are then automatically made. The two castings 14,15 are located together by means such as locating pins or spigots and are held together by a series of studs or bolts. Gaskets or sealing compounds are employed as required during the assembly operation. Any required connectors for the fuel supply and return lines are then fitted.

The completed manifold assembly is then mounted on the engine 11 in a conventional way so that passages 17 align with inlet ports 31 which connect to cylinders 12 through inlet valves 32. In use of the engine, the inlet manifold 13 and its fuel supply operate conventionally.

The complete inlet manifold 13 and fuel supply assembly is a unit consisting of a relatively small number of components which leads to a simple assembly operation and provides a potential for very high reliability.

While the invention is applicable particularly to spark ignition reciprocatory engines it could be used with other types of engine, for example multi-cylinder rotary engines. Similarly, a V-six or V-eight or V-twelve engine could have the concept applied to it.

Claims

1. An inlet manifold (13) and fuel supply assembly for a fuel injection internal combustion engine incorporating a plurality of cylinders (12) in a single bank with a common inlet manifold (13) for the bank of cylinders (12), characterised in that the manifold (13) is formed in two parts (14, 15) joined along an interface (16) extending longitudinally of the bank of cylinders (12), one part (14) of the manifold (13) defining a plurality of seat formations (19), each seat formation (19) being adapted to receive a fuel injector (21), the seat formations (19) opening at one end into an associated inlet passage (17), closure formations (20) corresponding to each seat formation (19) being provided on the other part (15) of the manifold (13) to retain the fuel injectors (21) in their seat formations (19) and a common fuel passage (25) within the manifold (13), said common fuel passage (25) communicating with each of the seat formations (19) for supplying fuel to the fuel injectors (21).

2. An inlet manifold (13) and fuel supply system as claimed in Claim 1 characterised in that an electrical connector rail (24) arranged within the manifold (13) to automatically make required electrical connections to the injectors (21) on assembly of the manifold (13).

3. An inlet manifold (13) and fuel supply assembly as claimed in Claim 1 or Claim 2 characterised in that a pressure relief valve (27) is provided in a chamber (26) defined by the two parts (14, 15) of the manifold (13).

4. An inlet manifold (13) and fuel supply assembly as claimed in any one of the preceding claims characterised in that the fuel passage (25) extends along the first part (14) of the manifold (13) and directly intercepts the seat formations (19).

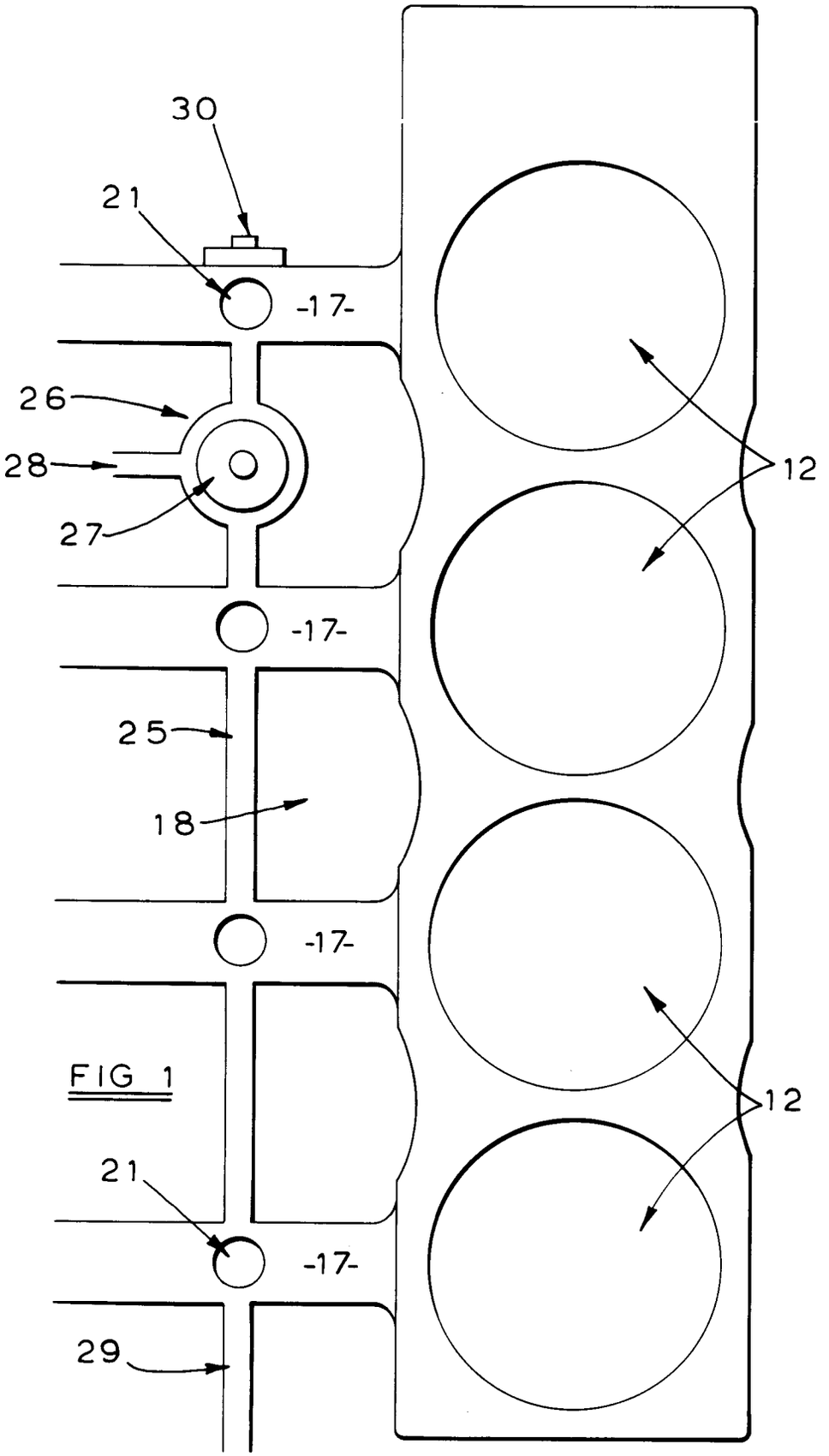

FIG 1

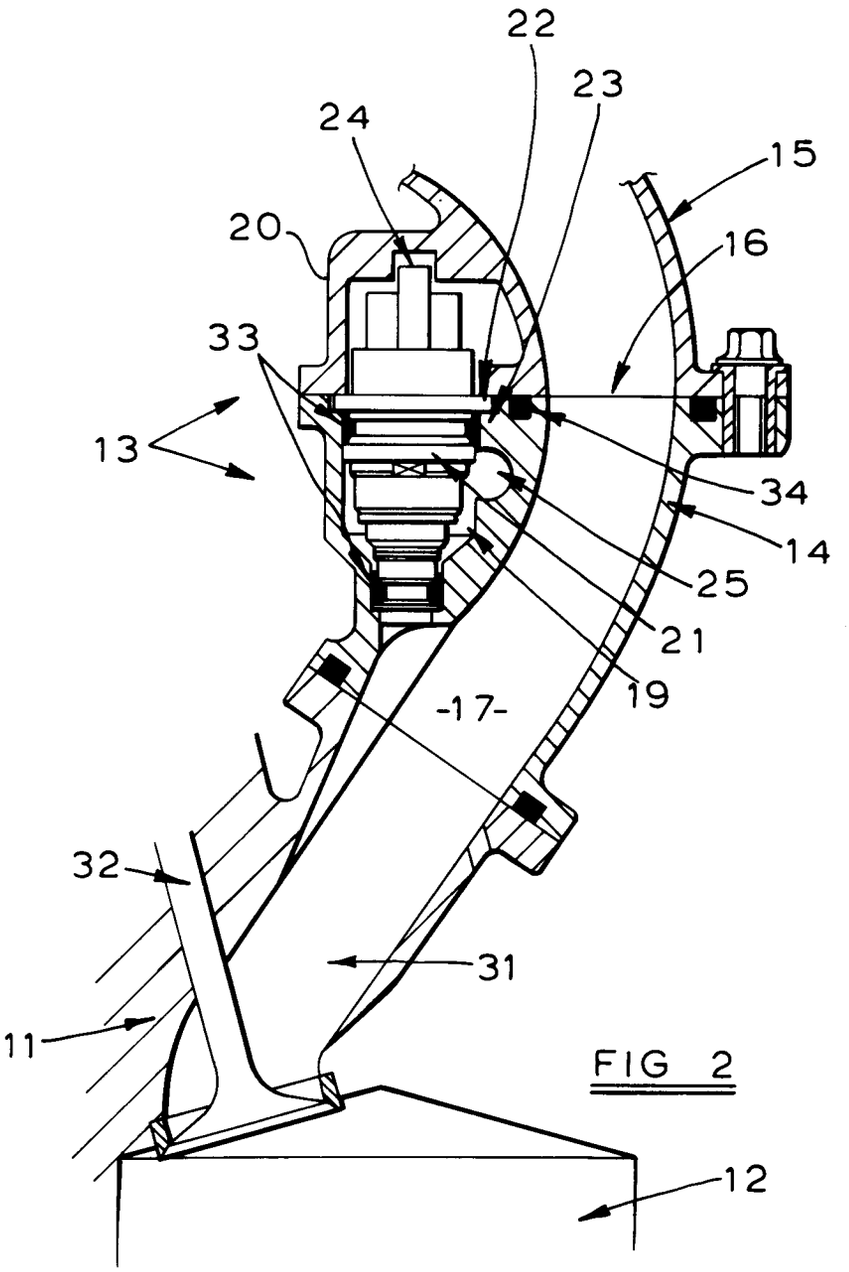

FIG 2