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EP-A- 0 261 855	GB-A- 1 195 060
GB-A- 2 032 521	GB-A- 2 142 089
GB-A- 2 165 886	GB-A- 2 173 857
GB-A- 2 195 394	US-A- 4 660 530

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Description

This invention relates to a component for a fuel injection system for use with an internal combustion engine, and particularly to a component as described in EP-A-0 261 855.

In that earlier specification which belongs to the state of the art according to Article 54(3) EPC, there is disclosed a fuel injection system component adapted to interface at one side with an engine cylinder head and at another side with an air intake manifold, the component comprising a block in which a plurality of air passages extend from said one side to said another side, the block including at least one passage for each cylinder of the engine, a plurality of fuel injector seats, and fuel feed and return passages communicating with the injector seats.

A fuel injection system component is also known from GB-A-2 142 089 which is adapted to be mounted between a cylinder head of an internal combustion engine and an air intake manifold and which has a plurality of main air passages extending through the component, a plurality of fuel injector seats and an end face adapted to interface directly with the engine cylinder head.

US-A-4 318 380 also shows a way of providing an idle-air supply duct. This idle-air supply duct extends from an open-sided groove in the end face of a fuel system component of a carburetor engine, said end face interfacing directly with the engine cylinder head. However, the idle air supply duct extends outside of the fuel component in the cylinder head, independently of the air supply route employed when the engine is running at load. The general design of the idle air supply duct is therefore complicated and involves high production costs. The invention proposes a cost effective way of providing an idle air duct in the component that is known from GB-A-2 142 089, whilst avoiding the disadvantages of the proposals known from US-A-4 318 380.

According to the present invention there is provided a fuel injection system component adapted to be mounted between an engine cylinder head of an internal combustion engine and an air intake manifold and having a plurality of main air passages extending through the component, a plurality of fuel injector seats, and an end face adapted to interface directly with the engine cylinder head, characterised in that said component comprises at least one main air passage for each cylinder of the engine, fuel feed and return passages communicating with the injector seats, and an idle air supply duct formed as an open-sided groove in said end face providing an idle air supply path from an idle air valve to each main air passage.

In one embodiment, a second open-sided groove can be formed in the same end face as the idle air supply duct, to provide ducts for conducting crankcase emissions to the main air passages. Preferably the second open-sided groove opens into the main air passages away from the fuel injector positions, to avoid any possibility of fouling the injectors.

When the component is installed, the open sides of the open-sided grooves will be closed by the cylinder head or intake manifold with which the said end face interfaces, so that the supply ducts are completed. Normally, the open sides will be closed by a gasket between the mating faces.

To serve the idle air supply function, there may be two independent open-sided grooves in the end face, each serving two cylinders of a four cylinder engine, and each with its own connection to an idle air valve. Where the invention is applied to an engine having a different number of cylinders, the open-sided grooves will be appropriately configured to provide the necessary communication with the air passages in the component.

In an alternative embodiment, the idle air supply ducts may be used for carrying crankcase emissions in addition to idle air, and in this case, the grooves preferably enter the main air passages at positions spaced from the entry into those passages of the fuel injectors, so as to avoid fouling of the injector passages by foreign particles emitted from the crankcase.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of one end face of a fuel injection system component in accordance with the invention;

Figure 2 is a cross-section through the component of Figure 1, on the line II-II; and

Figure 3 is a perspective view of an alternative form of component in accordance with the invention.

The drawings show details of only one face of the component 10 (the face which will interface with the cylinder head), and the reader is referred to GB-A-2 195 394 for details of the component.

Opening into the end face 12 are four main air passages 14 each of which provides a straight-through air connection from the intake manifold side to the cylinder head side shown. Opening into each passage 14 is an injector seat 18.

Formed in the flat end face 12 is a groove 20 which has a connection 22 for idle air and branches 23, 25, 27 and 29 leading into the respective cylinders.

A second groove 30 is also formed in the face 12, and this has a connection 32 for receiving crankcase emissions which are distributed to all

four air passages 14 so that these emissions can be burnt in the engine cylinders.

In an alternative embodiment shown in Figure 3, there are two grooves 20' each with a connection 22'. The grooves 20' extend to each of the passages 14, and because of the geometry of the arrangement shown, the pair of outermost passages 14 both experience the same idle air flow, as do the pair of innermost passages. By suitably apportioning the idle air reaching the grooves, it can be ensured that all the passages 14 receive the same volume of air.

In this embodiment, the grooves 20, also carry the crankcase emissions, and it will be noted that their points of entry to the passages 14 are angularly offset relative to the positions of the injector seats 18.

In use, the component 10 is to be fitted against a cylinder head 24, with a gasket 26 between the joint faces. As will be apparent from Figure 2, the gasket will close the open side of the groove 20 or 20'.

The grooves 20, 20' can easily be formed in the diecasting operation used to produce the component. No machining is required as the as-cast surface will be adequate for idle air.

Claims

1. A fuel injection system component (10) adapted to be mounted between an engine cylinder head (24) of an internal combustion engine and an air intake manifold and having a plurality of main air passages (14) extending through the component, a plurality of fuel injector seats (18), and an end face (12) adapted to interface directly with the engine cylinder head, characterised in that said component comprises at least one main air passage for each cylinder of the engine, fuel feed and return passages communicating with the injector seats (18), and an idle air supply duct formed as an open-sided groove (20, 20') in said end face providing an idle air supply path from an idle air valve to each main air passage (14).
2. A component as claimed in Claim 1, characterised in that two independent open-sided grooves (20, 30) are provided in the end face, one forming a duct (20) for idle air and the other forming a duct for crankcase emissions.
3. A component as claimed in Claim 1 or Claim 2, wherein the grooves (20, 20') enter the main air passages (14) at positions spaced from the entry into those passages of the fuel injectors (18).

Patentansprüche

1. Bauteil einer Kraftstoffeinspritzvorrichtung (10) für die Montage zwischen dem Motorzylinderkopf (24) eines Verbrennungsmotors und einem Luftansaugrohr adaptiert, das mehrere Hauptluftleitungen (14) beinhaltet, die sich in dem Bauteil erstrecken, sowie eine Mehrzahl von Kraftstoffeinspritzdüsensitzen (18) und eine Stirnfläche (12), die für den direkten Anschluß an den Zylinderkopf adaptiert ist, dadurch gekennzeichnet, daß genanntes Bauteil mindestens eine Hauptluftleitung für jeden Zylinder des Motors aufweist, Kraftstoffzu- und -rückleitungen, die mit den Einspritzdüsensitzen (18) verbunden sind, und eine Leerlaufuftzuführung in Form eines offenen Kanals (20, 20') in genannter Stirnfläche, wodurch ein Weg für die Leerlaufuftzufuhr von dem Leerlaufventil zu jeder Hauptluftleitung (14) geschaffen wird.
2. Bauteil nach Anspruch 1, dadurch gekennzeichnet, daß zwei voneinander unabhängige, offene Kanäle (20, 30) in der Stirnfläche geschaffen werden, wobei einer (20) als Leerlaufuftkanal dient und der andere als Kanal für die Emissionen des Kurbelgehäuses.
3. Bauteil nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß die Kanäle (20, 20') in die Hauptluftkanäle (14) an Stellen öffnen, die von den Eintrittsstellen der Kraftstoffeinspritzdüsen (18) möglichst weit entfernt sind.

Revendications

1. Composant de système d'injection de carburant (10) adapté pour être monté entre une tête de cylindre de moteur (24) d'un moteur à combustion interne et un collecteur d'admission d'air possédant plusieurs conduits d'air principaux (14) s'étendant à travers le composant, plusieurs sièges d'injecteur (18) et une surface terminale (12) adaptée pour être reliée directement à la tête de cylindre du moteur, caractérisé en ce que ledit composant comprend au moins un conduit d'air principal pour chaque cylindre du moteur, des conduits d'alimentation et d'échappement communiquant avec les sièges d'injecteur (18) et un canal d'alimentation d'air pour fonctionnement au ralenti en forme de cannelure à côtés ouverts (20, 20') dans ladite surface terminale, créant un chemin d'alimentation d'air pour fonctionnement au ralenti depuis une soupape d'air pour fonctionnement au ralenti jusqu'à chaque

conduit d'air principal (14).

2. Composant selon la revendication 1, caractérisé en ce que la surface terminale est munie de cannelures à côtés ouverts indépendantes (20,30), l'une d'elles formant un canal (20) pour l'air pour un fonctionnement au ralenti et l'autre, un canal pour les émissions du carter.

3. Composant selon la revendication 1 ou 2 dans lequel les cannelures (20, 20') pénètrent dans les conduits d'air principaux (14) en des points éloignés de l'entrée des conduits des injecteurs (18).

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