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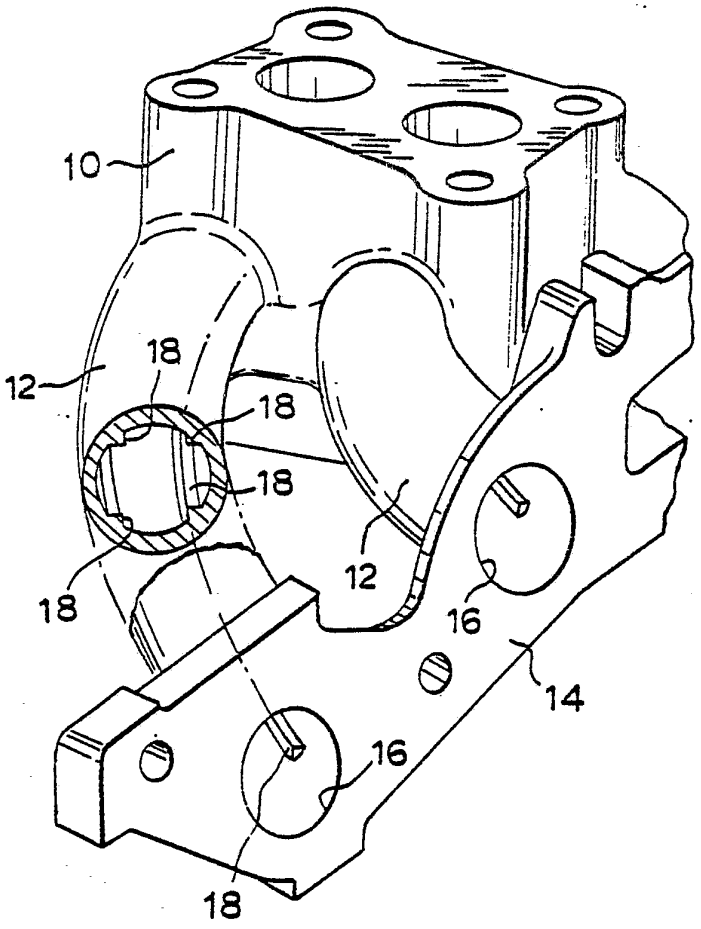
With international search report.

(54) Title: ENGINE INTAKE MANIFOLD

(57) Abstract

An engine intake manifold has ribs (18) extending along the internal walls (16) of the manifold passages (12) leading from the riser block (10) to the engine cylinders. Liquid fuel which is present in the manifold passages (12) is blown along the passages (12) by the flowing vapour which flows across the ribs (18), and is blown off the tops of the ribs to become vapourised before it reaches the engine.



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Engine Intake Manifold

In a carburetted internal combustion engine, an intake manifold is used to convey a fuel/air mixture from a carburettor to the engine cylinders. The carburettor produces a mixture of fuel and air, and this mixture is drawn along intake manifold passages by the suction produced by piston displacement.

As the vapourised fuel passes along the manifold passages, there is a tendency for the fuel to condense on the internal walls of the manifold. This is a particular problem when the engine is cold, and has an adverse effect on fuel consumption.

According to the invention, there is provided an engine intake manifold in which the internal walls of the passages which, in use, lead from a carburettor to the engine cylinders are provided with ribs arranged so that the fuel/air mixture flowing along the passages has to flow across the ribs.

The fuel/air mixture in fact flows along the manifold passages in a helical path, although the pitch of the helix changes as the throttle opening changes, and is smallest when the throttle opening is small. The ribs can thus be arranged so that they extend substantially parallel to the passage axis or, preferably, in a helix of opposite hand to that followed by the fuel/air mixture.

The liquid fuel in the manifold passages is driven along a helical path by the flowing fuel vapour. As the liquid reaches a rib, it is driven up the leading slope of the rib and is then projected from the top of the rib, so that it escapes from contact with the manifold wall in the form of droplets and the chances of vapourising this fuel are thereby enhanced.

The ribs preferably have a sharp tip, and may for example be of triangular cross-section. In addition, or alternatively to ribs which are continuous between the ends of the passages, annular ribs may be used which extend around the internal circumference of the passage.

The ribs are preferably formed integrally with the manifold wall, by casting with the manifold wall.

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

Figure 1 is a perspective view of part of an intake manifold according to the invention; and

Figure 2 is a detail view of a portion of a manifold passage wall.

The manifold shown in Figure 1 has a riser block 10 to which the outlet end of a carburettor can be bolted. In the embodiment shown, this will be a twin venturi carburettor. Manifold passages 12 lead from the riser 10 to an end plate 14 which will be bolted against the cylinder block of an engine. This is conventional technology.

Each manifold passage 12 has an internal wall 16. As can be seen from the sectioned part of the left-hand passage in Figure 1, a number of ribs 18, in this case four, are provided around the passage periphery. These ribs are triangular in section, and are formed integrally with the manifold wall. The ribs extend from one end of the passages to the other.

Figure 2 illustrates what happens to liquid fuel crossing the ribs 18. Because the fuel is driven in a helical path around the passage by the helically-moving vapour, it

follows a path indicated by arrow heads on the flow lines 20. The fuel is blown up the leading edge of the rib, and is then blown off from the top of the rib in the form of droplets 22 which are thereby introduced directly into the vapour flow and thus have a good chance of being maintained in the vapour state and of reaching the engine cylinders in this state.

Tests have shown that this configuration provides an appreciable improvement in fuel economy.

It is important to ensure that the internal walls of the manifold passages do not become so obstructed as to lead to an undesirable increase in back pressure which would adversely affect the fuel/air flow through the manifold.

The ribs shown in the Figures extend parallel to the passage axes. It is also possible to arrange the ribs along helical paths, on helixes of opposite hand to those which will be followed by the fuel and air.

The fuel and air flow pattern does change as the throttle opening changes, and on a single venturi carburettor, has a maximum swirl (smallest helix pitch) at about half open throttle. The situation is more complex with a twin venturi carbyrettor. To provide the same effect of projecting the liquid fuel up into the airstream at small and maximum throttle openings when there is little swirl, annular ribs which act as weirs can be provided so that a fuel/air mixture flowing straight along the passage will also have to flow across a rib. For maximum effect, the fuel should flow across the rib at right angles. For a particular rib, this will only be possible over a narrow range of conditions. However the rib or ribs in each passage will be positioned so that, over the anticipated range of flow conditions in that passage, the fuel and air will flow across as many ribs as possible, at as large an angle as possible to the length of the rib.

CLAIMS

1. An engine intake manifold in which the internal walls of the passages which, in use, lead from a carburettor to the engine cylinders are provided with ribs arranged so that the fuel/air mixture flowing along the passages has to flow across the ribs.

2. A manifold as claimed in Claim 1, in which the ribs are arranged so that they extend substantially parallel to the passage axis

3. A manifold as claimed in Claim 1, in which the ribs are arranged in a helix of opposite hand to that followed by the fuel/air mixture when it flows through the passage.

4. A manifold as claimed in any preceding claim, in which the ribs have a sharp tip.

5. A manifold as claimed in any preceding claim, in which the ribs are of triangular cross-section.

6. A manifold as claimed in any preceding claim, in which, in addition, or alternatively to ribs which are continuous between the ends of the passages, annular ribs extend around the internal circumference of the passage.

7. A manifold as cliamed in any preceding claim, in which the ribs are formed integrally with the manifold wall, by casting with the manifold wall.

8. An engine intake manifold substantially as herein described, with reference to the accompanying drawing.

1-1

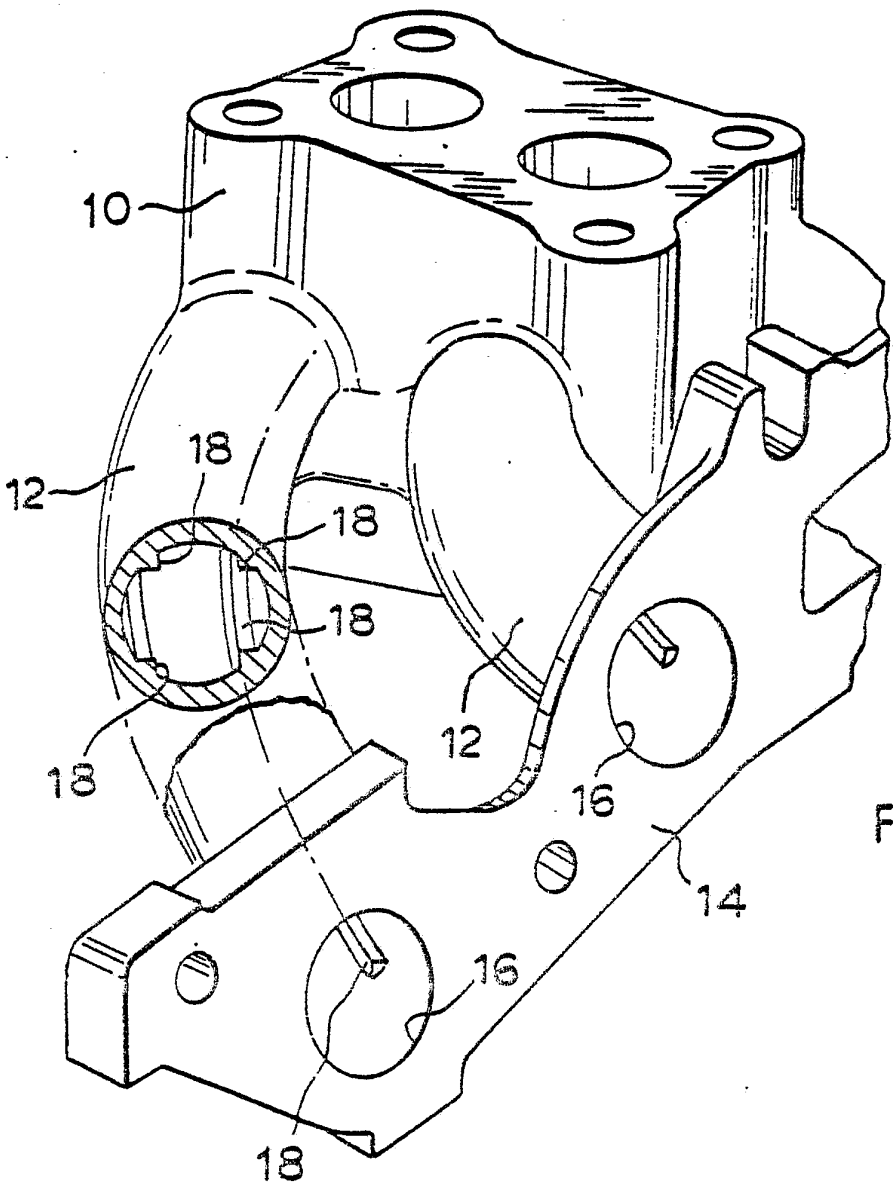

FIG. 1.

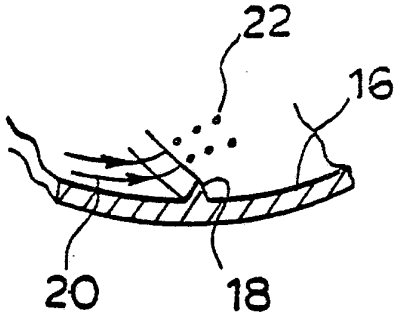

FIG. 2.

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 84/01576

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL.[3] F02B 31/00
U.S. CL. 123/52.M, 188.M, 306

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	123/52.M, 188.M, 306, 590

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A, 1,288,640 24 December 1918, Mauck	1-4
X	US, A, 1,305,174 27 May 1919, Smith	1-4
X	CA, A, 971,446 22 July 1975, Fabregat	1-4
A	US, A, 2,390,913 11 December 1945, Barrett	1-4

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
23 October 1984	02 NOV 1984
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/US	Craig R. Feinberg

Form PCT/ISA/210 (second sheet) (October 1981)

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. [X] OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. [ ] Claim numbers ..... because they relate to subject matter [12] not required to be searched by this Authority, namely:

2. [X] Claim numbers 5-8, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [13], specifically:

Claims 5-7 fail to comply with PCT Rule 6.4(a) in that multiple dependent claims can not serve as a basis for any other multiple dependent claims.

Claim 8 fails to comply with PCT Rule 6.2 in that the claim shall not depend on references to the description or drawings.

VI. [ ] OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

This International Searching Authority found multiple inventions in this international application as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. [ ] As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

[ ] The additional search fees were accompanied by applicant's protest.

[ ] No protest accompanied the payment of additional search fees.