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(54) **Exhaust manifold for an engine**

(57) An exhaust manifold comprising, sequentially,
an inlet (12); a first tubular portion (14); a bent portion
(16); a second tubular portion (18); and an outlet (20);
characterised in that the bent portion comprises an el-

bow (22) connected to the first tubular portion, and an
inflexion (24) adjacent the elbow and connected to the
second tubular portion.

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Description

Technical Field

[0001] The present invention relates to an exhaust manifold for an internal combustion engine.

Background of the Invention

[0002] Exhaust manifolds for engines may include a bent portion. Such a bent portion may induce flow separation at the inner radius surface of the bent portion. The flow separation can have an effect on the efficiency of the catalytic converter (downstream of the bent portion) because of non-uniform exhaust gas flow and pressure loss.

Summary of the Invention

[0003] It is an objection of the present invention to overcome this problem.

[0004] An exhaust manifold in accordance with the present invention is characterised by the features specified in claim 1.

[0005] The present invention overcomes the problem of flow separation.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is three side views of an exhaust manifold in accordance with the present invention; and
Figure 2 is an enlarged side view of the exhaust manifold of Figure 1.

Description of the Preferred Embodiment

[0007] The exhaust manifold 10 comprises, sequentially, an inlet 12; a first tubular portion 14; a bent portion 16; a second tubular portion 18; and an outlet 20. The bent portion 16 comprises an expanded portion or elbow 22 and an adjacent inflexion 24 at the outer radius surface 26 of the bent portion. The inflexion 24 is located between the elbow 22 and the second tubular portion 18. The elbow 22 has an enlarged diameter relative to the first and second tubular portions 14, 18 to define a concave inner surface which is substantially hemispherical in shape. The inflexion 24 is a line where the curvature of a portion of the inner surface changes from concave to convex. The combination of the elbow 22 and the inflexion 24 collectively enforce a reverse flow of exhaust gases passing through the manifold 10 with minimal flow separation.

[0008] Such an arrangement substantially prevents the common flow separation at the inner-radius surface

of the bent portion 16, through optimal opposing pressure fields. The prevention of the flow separation at the bent portion 16 results in an improvement in the exhaust gas flow profile (uniform distribution and directional angle) with consequent improvement of the catalytic converter flow uniformity index and pressure loss, thereby providing improvements in emission conversion, converter aging, as well as engine power/torque performance.

[0009] The present invention provides an exhaust manifold which offers a solution to the problem of flow through broad acute-to-obtuse (in the range 60-120 degrees) bends, where flow separation within the bent portion may result in downstream flow mal-distribution, turbulence and pressure loss. This is particularly important where a close-coupled catalytic converter is positioned in the exhaust system, where flow uniformity is critical to optimum utilization, performance and durability of the catalyst. The present invention is ideally suited for use with diesel engines, where the catalytic converter is interfaced to a turbocharger, but packaging restrictions enforce a substantially L-shaped exhaust manifold.

Claims

1. An exhaust manifold comprising, sequentially, an inlet (12); a first tubular portion (14); a bent portion (16); a second tubular portion (18); and an outlet (20); **characterised in that** the bent portion comprises an expanded elbow (22) connected to the first tubular portion, and an inflexion (24) adjacent the elbow and connected to the second tubular portion.
2. An exhaust manifold as claimed in Claim 1, wherein the elbow (22) has an enlarged diameter relative to the diameter of the first and second tubular portions (14,18).
3. An exhaust manifold as claimed in claim 1 or Claim 2, wherein the inner surface of the elbow (16) is concave and substantially hemispherical in shape.
4. An exhaust manifold as claimed in Claim 1, wherein the bent portion (16) is bent through an angle in the range 60 degrees to 120 degrees.

Fig.1A.

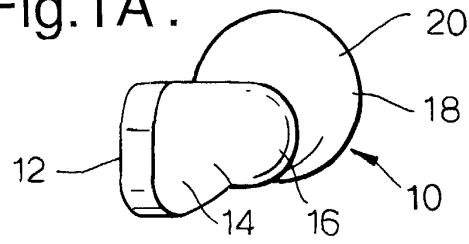


Fig.1B.

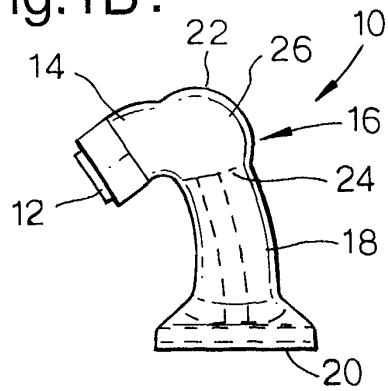


Fig.1C.

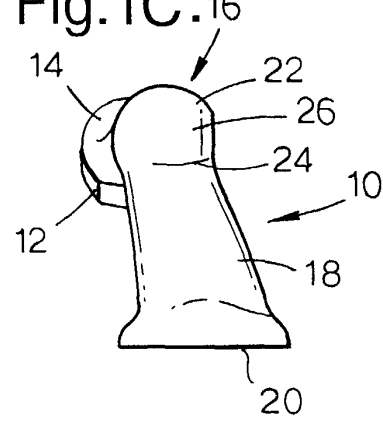
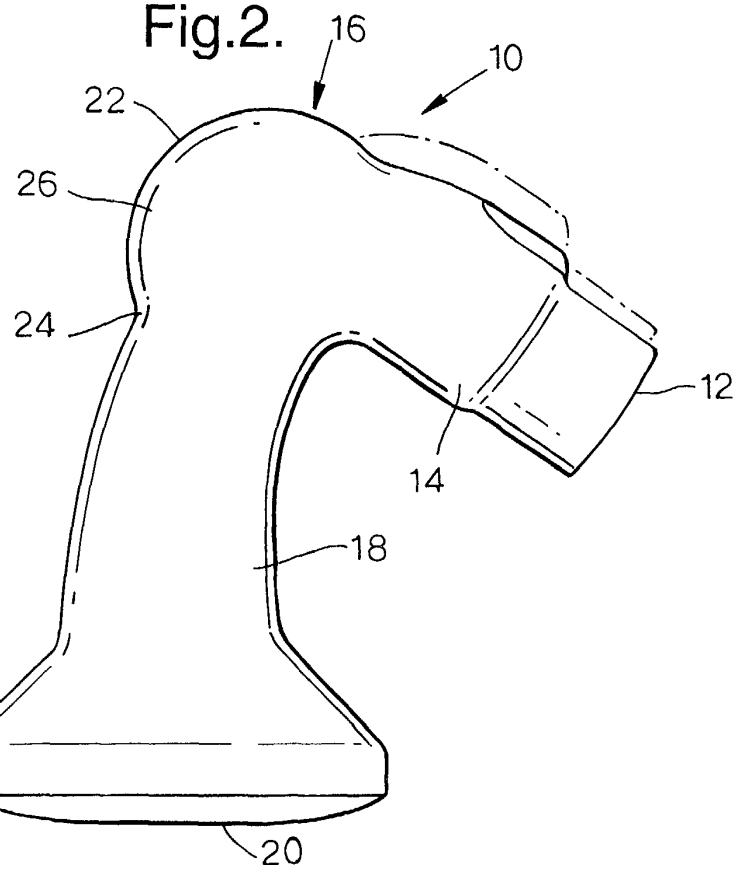


Fig.2.





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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 5220

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A	EP 0 195 528 A (HORII KIYOSHI ; AKATAKE ENG CO LTD (JP)) 24 September 1986 (1986-09-24) * claims 1,2; figure FIG * ---	1-4	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 3 May 2002	Examiner Tatus, W
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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