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(54) Flow straightener in the air induction pipe of an internal combustion engine

(57) A flow straightener 1 in the air induction pipe of an internal combustion engine with boost pressure admission, consists of a sprung sheet-metal strip and is configured with multiple bends in its longitudinal extension to form air guidance ducts 5–10 and which is inserted preloaded into the air induction pipe so that its position is fixed. The sprung sheet-metal strip is fastened by engaging in an annular recess provided in the air induction pipe. The external convex bends of the clover leaf-like sheet-metal strip may engage in correspondingly matched pockets in the air induction pipe so as to be axially and rotationally fixed.

Fig. 1

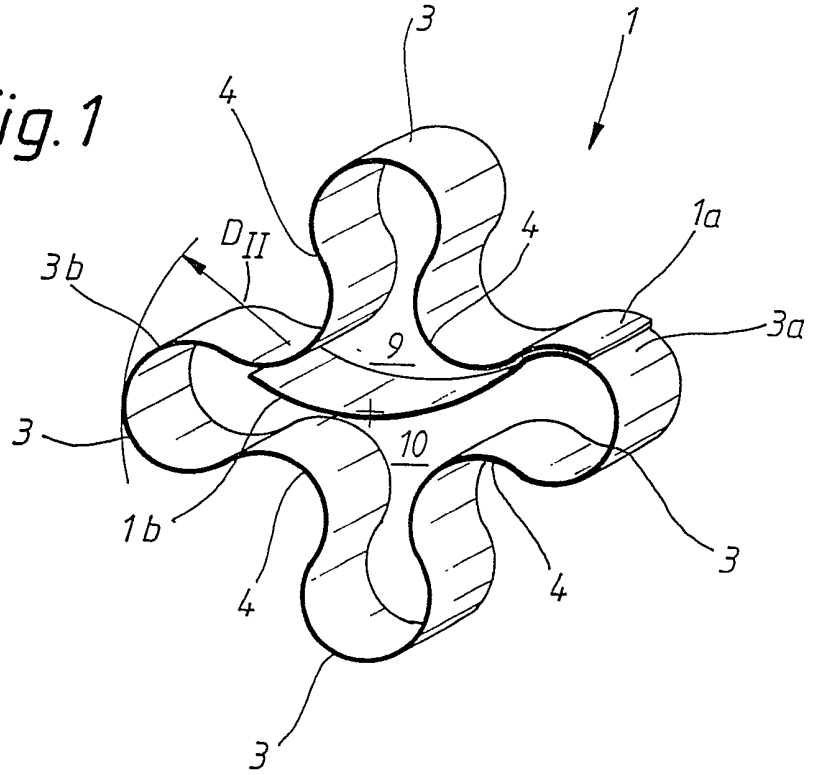

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Fig. 1

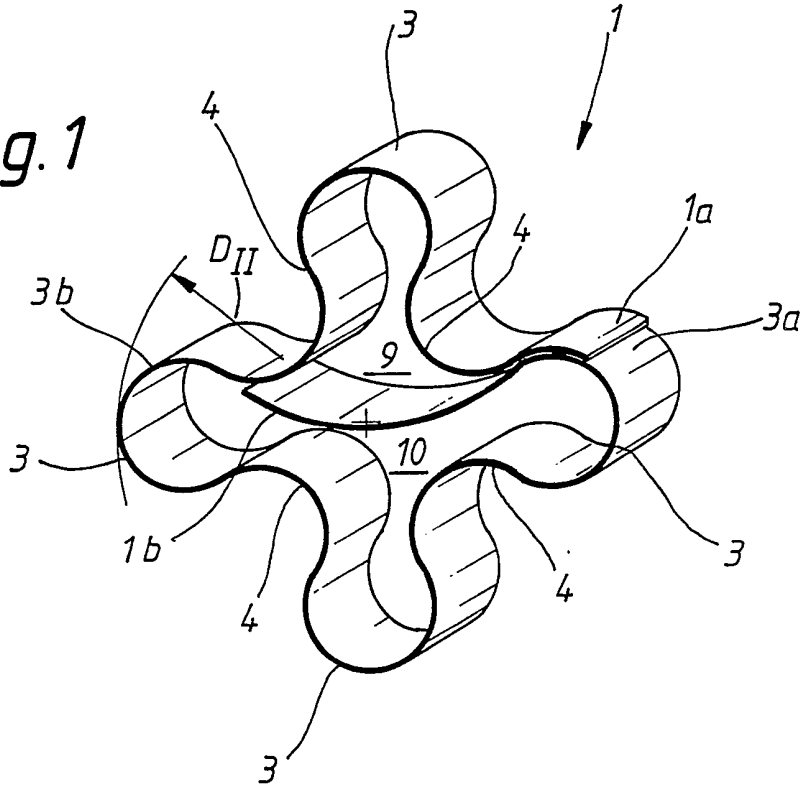


Fig. 2

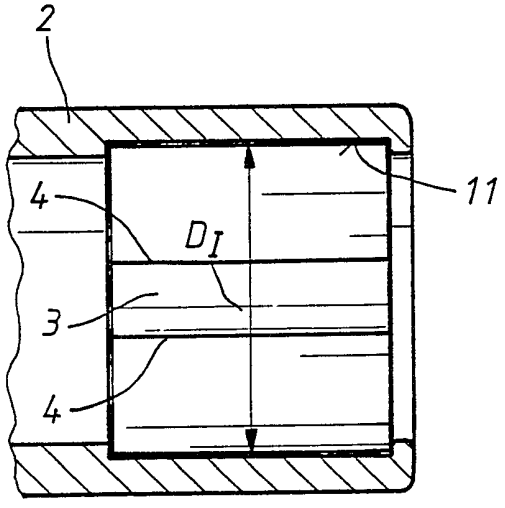


Fig. 3

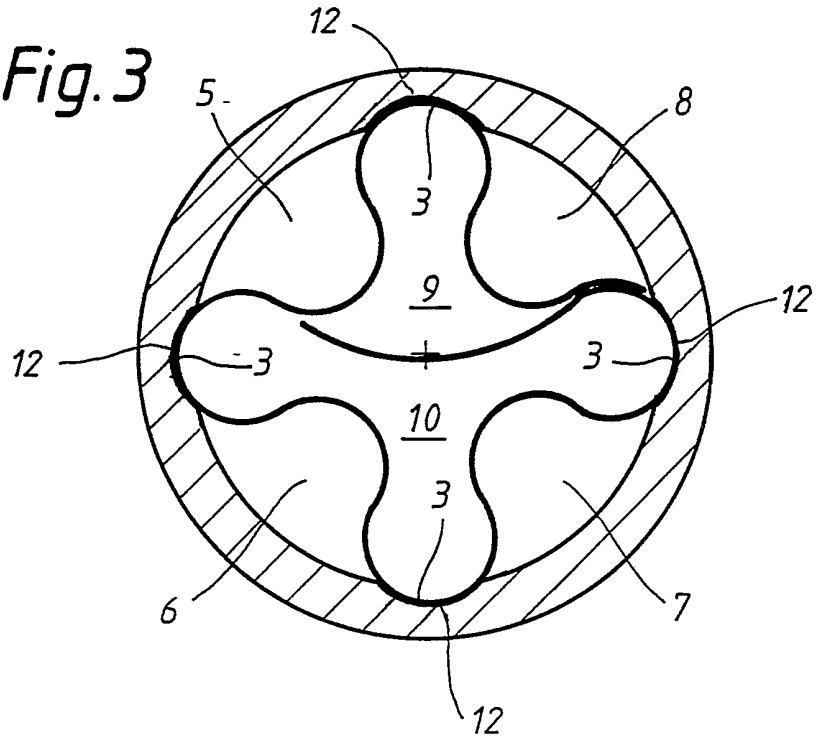
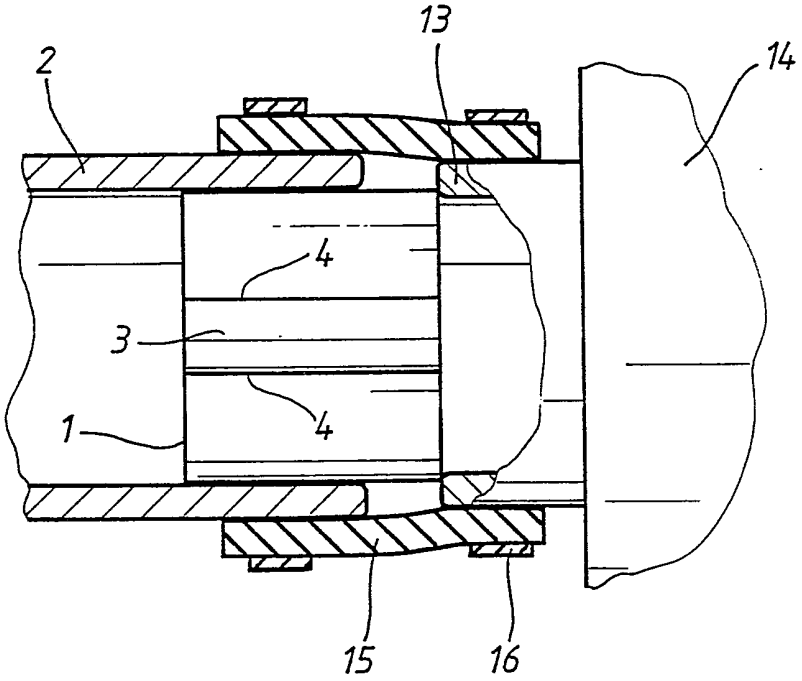


Fig. 4



Flow straightener in the air induction pipe of an internal combustion engine.

The invention concerns a flow straightener adapted to be inserted in the air induction pipe of an internal combustion engine, which flow straightener has air guidance ducts extending in the flow direction to straighten the airflow.

Flow straighteners before the air inlet of the compressor turbine of an exhaust gas turbocharger are used to settle or smooth eddying air in the air induction pipe in order to obtain an improved efficiency of the exhaust gas turbocharger, and therefore of the internal combustion engine, particularly in the lower rotational speed range.

From DE 32 28 858 C2, it is known to use flow straighteners of honeycomb structure in order to straighten the airflow in the air induction pipe. These flow straighteners consist of a bundle of metal tubes, for the formation of air guidance ducts, which settle the air flowing through them. Also usual, however, are flow straighteners with grids of honeycomb structure, which consist of slotted metal plates pushed into one another and brazed or welded together and provided with a stiffening ring for stabilisation.

The present invention seeks to substantially simplify the structural complexity of the flow straightener and to permit simple assembly in the air induction pipe.

According to the present invention there is provided a flow straightener adapted to be inserted in the air induction pipe of an internal combustion engine, which flow straightener has air guidance ducts extending in the flow direction to straighten the airflow, wherein the flow straightener comprises a sprung sheet-metal strip which is configured with multiple bends in its longitudinal extension to form air guidance ducts and which is adapted to be inserted preloaded into the air induction pipe so that its position is fixed.

The flow straightener consisting of only one part, i.e.

a sprung sheet-metal strip, can be manufactured inexpensively and assembled in a very simple manner because it can be pushed into the air induction pipe as a preloaded insertion body.

An advantageous embodiment of the invention is provided by forming the sprung sheet-metal strip into a shape like a clover leaf, preferably a four leaf clover.

As a further beneficial development of the invention, provision is made for one free end of the cloverleaf-like sheet-metal strip to rest on one of the convex bends and for its other free end to cross the inner guidance duct formed by the sheet-metal strip, thus dividing it into two or more ducts of approximately equal size.

Preferably, the sprung sheet-metal strip is fastened by engaging in an annular recess provided in the air induction pipe. The external convex bends of the clover leaf-like sheet-metal strip may engage in correspondingly matched pockets in the air induction pipe so as to be axially and rotationally fixed. In a preferred embodiment, the flow straightener is adapted to be located in the air induction pipe upstream of an inlet pipe of the compressor wheel of an exhaust gas turbocharger, wherein in the case of an air induction pipe which has a larger diameter than the inlet pipe of the compressor wheel, part of the flow straightener protrudes from the air induction pipe and is in contact with the said inlet pipe.

Embodiments of the invention are shown in the drawing and described in more detail below. In the drawing:

Fig. 1 shows, in perspective view, a flow straightener formed from a sprung sheet-metal strip,

Fig. 2 shows the flow straightener as an insertion body in the air induction pipe,

Fig. 3 shows the installed flow straightener in cross-section,

Fig. 4 shows the flow straightener installed between the air induction pipe and the inlet pipe for the compressor turbine.

A flow straightener 1 in the air induction pipe 2 of an internal combustion engine with pressure admission consists of a sprung sheet-metal strip with multiple, alternately convex and concave, bends 3, 4, which is shaped to form a multi-leaf clover, for example a four-leaf clover as shown in Fig. 1. One free end 1a of the sheet-metal strip rests on the convex bend 3a, and from there the other free end 1b of the sheet-metal strip reaches in a slightly curved concave form to approximately the opposite convex bend 3b.

The particular configuration of this sheet-metal strip with multiple bends provides guidance ducts acting, in the installed condition, to straighten the airflow; of these guidance ducts, the outer ones are indicated by 5, 6, 7 and 8 and the inner ones by 9, 10. The ducts 9, 10 are formed by the free end 1b of the sheet-metal strip which, acting as a partition, divides the inner space formed by the bends.

The air induction pipe 2 is provided, as shown in Fig. 2, with a turned recess for the axial positional fixing of the flow straightener 1, the diameter D_I of the recess being smaller than the diameter D_{II} of the flow straightener 1 in its expanded form. It is, however, also possible for an annular recess 11 to be precast in the air induction pipe 2. On assembly, the flow straightener 2 is pushed preloaded into the air induction pipe 1 and engages there in the recess 11.

In order to achieve fixing of the flow straightener 2 in the direction of rotation, as well as axial positional fixing, pockets 12 evenly distributed in the peripheral direction and matching the convex bends 3 of the sheet-metal strip are provided instead of an annular recess in the air induction pipe 1. The flow straightener 1 snaps into these pockets during assembly so as to be axially and rotationally fixed (Fig. 3).

Fig. 4 shows an air induction pipe 2 whose inner diameter is larger than that of the inlet pipe 13 for the compressor turbine 14 of the exhaust gas turbocharger. In

this embodiment, the flow straightener 1 is located substantially in the air induction pipe 2. The free end of the flow straightener 1 protruding from the air induction pipe 2 is in contact with the inlet pipe 13 and is therefore fixed in the direction of the compressor turbine 14. The air induction pipe 2 and the inlet pipe 13 are clamped together by means of a hose 15 with hose clips 16.

The sprung sheet-metal strip can also have the shape of a star or a spiral or a similar geometrical shape which divides the air space. These shapes can also be manufactured and assembled inexpensively.

The flow straightener 1 can also be precast into the air induction pipe 2.

Claims

1. A flow straightener adapted to be inserted in the air induction pipe of an internal combustion engine, which flow straightener has air guidance ducts extending in the flow direction to straighten the airflow, wherein the flow straightener comprises a sprung sheet-metal strip which is configured with multiple bends in its longitudinal extension to form air guidance ducts and which is adapted to be inserted preloaded into the air induction pipe so that its position is fixed.

2. A flow straightener according to Claim 1, wherein the sprung sheet-metal strip is formed into a shape like a clover leaf.

3. A flow straightener according to claim 2 wherein the strip is formed into the shape of a four leaf clover.

4. A flow straightener according to Claim 2 or 3, wherein one free end of the clover leaf-like sheet-metal strip rests on one of the external convex bends and its other free end crosses the inner guidance duct formed by the sheet-metal strip, thus dividing it into two ducts of approximately equal size.

5. A flow straightener according to any one of the preceding claims, wherein the sprung sheet-metal strip is fastened by engaging in an annular recess provided in the air induction pipe.

6. A flow straightener according to any one of the preceding Claims 1 to 4, wherein the external convex bends of the clover leaf-like sheet-metal strip engage in correspondingly matched pockets in the air induction pipe so as to be axially and rotationally fixed.

7. A flow straightener according to Claim 1, which is adapted to be located in the air induction pipe upstream of an inlet pipe of the compressor wheel of an exhaust gas turbocharger, wherein in the case of an air induction pipe which has a larger diameter than the inlet pipe of the compressor wheel, part of the flow straightener protrudes from the air induction pipe and is in contact with the said inlet pipe.

8. A flow straightener adapted to be inserted in the air induction pipe of an internal combustion engine, substantially as described herein with reference to and as illustrated in the accompanying drawings.

Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number: GB 9300073.5

Relevant Technical fields

(i) UK Cl (Edition L) G3H (HEA)

(ii) Int Cl (Edition 5) F15D

Search Examiner: R L WILLIAMS

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search: 8 MARCH 1993

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 0528385 (C G VOKES)	1
A	GB 0408963 (A SWAN)	1

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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