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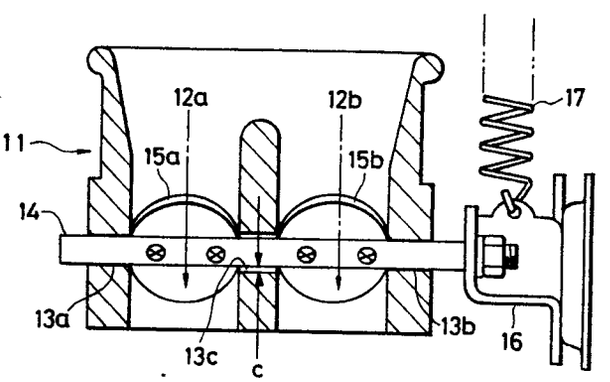
(54) Throttle valve assembly body.

(57) A throttle valve assembly body comprises a main valve body portion (11) formed integrally a pair of intake air passages (12a, 12b) therein and a throttle valve shaft (14) having two throttle valves (15a, 15b). Three through-hole portions (13a, 13b, 13c) are formed through the main valve body portion (11) so as to penetrate the throttle valve shaft (14). Two end through-hole portions (13a, 13b) support and fit freely rotatively the throttle valve shaft (14). An intermediate through-hole portion (13) has a larger diameter that of an outer diameter of the throttle valve shaft (14). A clearance (c) is formed between the intermediate through-hole portion (13c) and the throttle valve shaft (14). The clearance (c) is set larger than a bending amount of the throttle valve shaft (14). The clearance (c) is to be set more than 80μm. Friction and/or seizure can not cause at the intermediate through-hole portion (13c) and the assurance of the smoothly turning of the throttle valve shaft (14) can be attained.

FIG. 1



EP 0 226 814 A2

THROTTLE VALVE ASSEMBLY BODY

BACKGROUND OF THE INVENTION

(Field of the Invention)

The present invention relates to a throttle valve assembly body and, more particularly to a throttle valve assembly body comprising a main valve body portion having a pair of intake air passages each of which provides a throttle valve therein, respectively. The throttle valve assembly body of this kind is used widely in a fuel injection type gasoline internal combustion engine such as in an automobile.

(Description of the Prior Art)

Fig. 4 shows a cross-sectional view of one example of a twin type throttle valve assembly body of the fuel injection type gasoline internal combustion engine. The twin type throttle valve assembly body including a pair of main valve body portions have been known in Japanese Patent Laid-Open Publication No. 214654/1983.

The above conventional twin type throttle valve assembly body includes a pair of main valve body portions 101a and 101b. A pair of throttle valve shafts 102a and 102b are arrayed at orthogonally through and supported rotatively within the respective main valve body portions 101a and 101b. Each of throttle valve 103a or 103b is fixed on the throttle valve shaft 102a or 102b, respectively.

An accelerator lever 114 is provided to the throttle valve shaft 102b and forced to give a turning force by a spring 115 at a close-valve direction. Two stopper levers 114a and 114b are mounted on one end portion of the throttle valve shafts 102a and 102b, respectively.

An intermediate link 107 is connected to between the throttle valve shafts 102a and 102b and interlocks together the throttle valve shafts 102a and 102b. Thereby the throttle valve shaft 102a can be turn at the same turning degree that of the throttle valve shaft 102b, when another throttle valve shaft 102b is turned through the accelerator lever 114.

The interlocking mechanism will be explained below in detail. The throttle valve shaft 102a or 102b forms respectively a male screw portion at a facing end portion to the throttle valve shaft 102b or 102a. Two levers 105 and 112 are mounted on the respective male screw portions by nuts 106a and 106b. The nuts 106a and 106b form respectively ball bearing portions within themselves.

The intermediate link 107 forms integrally two ball members 107a and 107b at both end portions thereof. The ball members 107a and 107b are fitted respectively themselves into the ball bearing portions of the nuts 106a and 106b. Two levers 107c and 107d are mounted integrally on the intermediate portion of the intermediate link 107 and disposed to be opposite respectively to the lever 105 and the lever 112.

The lever 105 and the lever 107c are fixed at a relative position by a setscrew 110 and a check nut 111. The lever 112 and the lever 107d are fixed at a relative position by suitably adjusting an adjustment screw 108. A spring 109 is disposed between the adjustment screw 108 and the lever 112.

When the relationship position between the lever 107c and the lever 112 is adjusted, however the lever 107d can be move any amount of range by squeezing the adjustment screw 108. Because of even though one stopper 104a of which the stoppers 104a and 104b contacts to the main valve body portion 101a, another stopper 104b parts from the main body portion 101b.

As a result, the adjustment of an air amount during idling operation becomes difficult extremely. For the interlocking mechanism having the intermediate link 107 interlockes two throttle valve shafts 102a and 102b each other, therefore many constituting components may be necessity, and further the throttle valve assembly body may be become large and increase in weight.

For the dissolution of the above inconveniences, a throttle valve assembly body, in which two main valve body portions are combined to each other and formed integrally and further single throttle valve shaft penetrates through the combined main valve body portion, may be supposed. However, by the adaption of such a throttle valve assembly body, the throttle valve assembly body may be become small and light in weight and further require no adjustment operation such as the intermediate link member.

However, when single throttle valve shaft having two throttle valves thereon is disposed so as to be penetrated the combined main valve body portion, the throttle valve shaft may be supported at three through-hole portions of the combined main valve body portion, which are two end through-hole portions and a central through-hole portion.

If the throttle valve shaft bend, a locally strong pressure may be cause at a part of bearing portions or two end through-hole portions, therefore there is the possibility that the throttle valve shaft can not turn smoothly.

When the throttle valve shaft is prevented from turning smoothly, for example, even though the driver releases a force from the accelerator pedal, the inconveniences such as a check for operating the close-valve direction of the throttle valve shaft by the spring will be brought.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a throttle valve assembly body wherein a throttle valve shaft can be turn smoothly.

Another object of the present invention is to provide a throttle valve assembly body wherein a throttle valve shaft is not contact with an inner surface of a central through-hole portion of a main valve body portion.

Further object of the present invention is to provide a throttle valve assembly body wherein a number of the constituting components therefor can be decreased.

Still object of the present invention is to provide a throttle valve assembly body wherein a throttle valve assembly body can be made smaller and lighter in weight.

A throttle valve assembly body comprises a main valve body portion formed integrally a pair of intake air passages therein and a throttle valve shaft having two throttle valves at orthogonally to the pair of intake air passages. Two throttle valves are disposed respectively one of the intake air passages.

Three through-hole portions are formed through the main valve body portion so as to penetrate the throttle valve shaft. Two end through-hole portions of three through-hole portions support and fit freely rotatively the throttle valve shaft. An intermediate through-hole portion of three through-hole portions has a larger diameter that of an outer diameter of the throttle valve shaft. A clearance is formed between the intermediate through-hole portion and the throttle valve shaft. The clearance is set larger than a bending or deflection amount of the throttle valve shaft. The clearance is to be set more than 80μm. The throttle valve shaft may be supported at two end portions via bearing members and bearing pressure members.

According to the throttle valve assembly body of the present invention, the throttle valve shaft is supported on two end through-hole portions among of three through-hole portions in which the throttle valve shaft penetrates through the main valve body portion and loosely fitted on the intermediate through-hole portion of three through-hole portions. Thereby even though the throttle valve shaft bend, friction and/or seizure can not cause at the intermediate through-hole portion and the assurance of the smoothly turning of the throttle valve shaft can be attained.

According to the present invention, the throttle valve assembly body can be constituted smaller, lighter in weight and at low cost. The throttle valve shaft can be turned smoothly, and also the throttle valve assembly body has an excellent effect that there is no need for maintenance and inspection.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. I shows a cross-sectional view of a throttle valve assembly body according to one embodiment of the present invention;

Fig. 2 shows an explanation view for setting a clearance
and also a relationship between measurement portions and bending amounts of the throttle valve shaft;

Fig. 3 shows a cross-sectional view of a throttle valve assembly body according to another embodiment of the present invention; and

Fig. 4 shows a cross-sectional view of prior art of a conventional twin type throttle valve assembly body.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. I shows a cross-sectional view of a throttle valve assembly body according to one embodiment of the present invention. A main valve body portion II of the throttle valve assembly body in a fuel injection type gasoline internal combustion engine such as in an automobile forms integrally and provides a pair of intake air passages I2a and I2b therein. The main valve body portion II has three through-hole portions I3a, I3b and I3c therewith at same plan linear line.

Single throttle valve shaft I4 is disposed within the main valve body portion II at orthogonally to the pair of intake air passages I2a and I2b through three through-hole portions I3a, I3b and I3c. The throttle valve shaft I4 provides two throttle valves I5a and II5b thereon. The throttle valve I5a is disposed in the intake air passage I2a. While the throttle valve I5b is disposed in the intake air passage I2b. An accelerator lever I6 is provided to the throttle valve shaft I4 and forced to give a turning force by a spring I7 at a close-valve direction.

Among of three through-hole portions I3a, I3b and I3c, two through-hole portions I3a and I3b which are positioned respectively at end portions and constitutes bearing portions of the throttle

valve shaft I4 so that the throttle valve shaft I4 can be fitted freely rotatively at two end through-hole portions I3a and I3b. Besides, the central or intermediate through-hole portion I3c has larger diameter than an outer diameter of the throttle valve shaft I4 and constitutes a loose fit portion.

Therefore, a clearance c is formed between an outer surface of the throttle valve shaft I4 and an inner surface of the central through-hole portion I3c. The dimensions of the clearance c are set larger than a bending or deflection amount of the throttle valve shaft I4 which is a deflection amount deflected by receiving a bending force.

To put it concretely, the dimensions of the clearance c is set larger than the bending or deflection amount which correspondes an estimate maximum bending amount when the throttle valve shaft I4 would be received.

By this throttle valve assembly body, when the throttle valve shaft I4 is bent, the throttle valve shaft I4 is not contact with the inner surface of the central through-hole portion I3c, therefore the throttle valve shaft I4 is free from the prevention of the smoothly turning.

Fig. 2 shows an explanation view of one example for setting the dimensions of the clearance c. The throttle valve shaft I4 is made of the soft iron (JIS S45C) and is a I0 mm in the diameter.

Four measurement portions A, B, C and D are set on the throttle valve shaft I4. Such a measurement portions A, B, C and D are positioned at installation portions of two throttle valves I5a and I5b with the throttle valve shaft I4. The bending amounts of the throttle valve shaft I4 in the measurement portions A, B, C and D are shown as a curve Y in Fig. 2, when the throttle valve assembly body is subjected to under a negative pressure value at -650 mm Hg. The maximum bending amount of the throttle valve shaft I4 in this case is about 80μm. The dimensions of the clearance c must be set larger than that of this maximum value, namely more than 80μm.

Fig. 3 shows different second embodiment of the present invention. The difference between the second embodiment and the first embodiment is constituting components for supporting the throttle valve shaft I4. The throttle valve shaft I4 in the second embodiment is supported at two end through-hole portions I3a and I3b thereof via bearing members 2Ia and 2Ib. The clearance c is formed between the inner surface of the central or intermediate through-hole portion I3c and the outer surface of the throttle valve shaft I4 and constitutes a loose fit portion as same as the first embodiment. The bearing members 2Ia and 2Ib are hold by bearing pressure members 22a and 22b, respectively.

Although by this throttle valve assembly body, when the throttle valve shaft I4 is bent, the throttle valve shaft I4 is not contact with the inner surface of the central through-hole portion I3c, therefore the throttle valve shaft I4 is free from the prevention of the smoothly turning.

In both the first and the second embodiments, the throttle valve assembly body is made smaller so as to constitute the integral component structure of the main valve body portion. The throttle valve assembly body structure becomes to be simple and also cut down the manufacturing cost thereof, because of no intermediate link member and no attaching members thereof. Further it is not necessary to provide the intermediate link member therein.

Claims

I. A throttle valve assembly body comprising;
a main valve body portion (II) formed integrally a pair of intake air passages (I2a, I2b) therein, a throttle valve shaft (I4) having two throttle valves - (I5a, I5b) disposed through said main valve body portion (II) at orthogonally to the pair of intake air passages (I2a, I2b), and said throttle valves (I5a, I5b) disposed respectively one of the intake air passages (I2a, I2b) characterized in that
three through-hole portions (I3a, I3b, I3c) are formed through said main valve body portion (II) so as to penetrate said throttle valve shaft (I4), two end through-hole portions (I3a, I3b) of said three through-hole portions (I3a, I3b, I3c) support and fit freely rotatively said throttle valve shaft (I4), an intermediate through-hole portion (I3c) of said three through-hole portions (I3a, I3b, I3c) has a larger diameter that of an outer diameter of said throttle valve shaft (I4), and a clearance (c) is formed between said intermediate through-hole portion - (I3c) and said throttle valve shaft (I4).

2. A throttle valve assembly body according to claim I, characterized in that said clearance (c) is set larger than a bending amount of said throttle valve shaft (I4).

3. A throttle valve assembly body according to claim I, characterized in that said clearance (c) is to be set more than 80μm.

4. A throttle valve assembly body comprising;
a main valve body portion (II) formed integrally a pair of intake air passages (I2a, I2b) therein, a throttle valve shaft (I4) having two throttle valves - (I5a, I5b) disposed through said main valve body portion (II) at orthogonally to the pair of intake air passages (I2a, I2b), and said throttle valves (I5a, I5b) disposed respectively one of the intake air passages (I2a, I2b) characterized in that
three through-hole portions (I3a, I3b, I3c) are

formed through said main valve body portion (II) so as to penetrate said throttle valve shaft (I4) at two end portions via bearing members (2Ia, 2Ib) and bearing pressure members (22a, 22b), two end through-hole portions (I3a, I3b) of said three through-hole portions (I3a, I3b, I3c) support and fit freely rotatively said throttle valve shaft (I4), an intermediate through-hole portion (I3c) of said three through-hole portions (I3a, I3b, I3c) has a larger diameter that of an outer diameter of said throttle valve shaft (I4), and a clearance (c) is formed between said intermediate through-hole portion - (I3c) and said throttle valve shaft (I4).

5. A throttle valve assembly body according to claim 4, characterized in that said clearance (c) is set larger than a bending amount of said throttle valve shaft (I4).

6. A throttle valve assembly body according to claim 4, characterized in that said clearance (c) is to be set more than 80μm.

FIG. 1

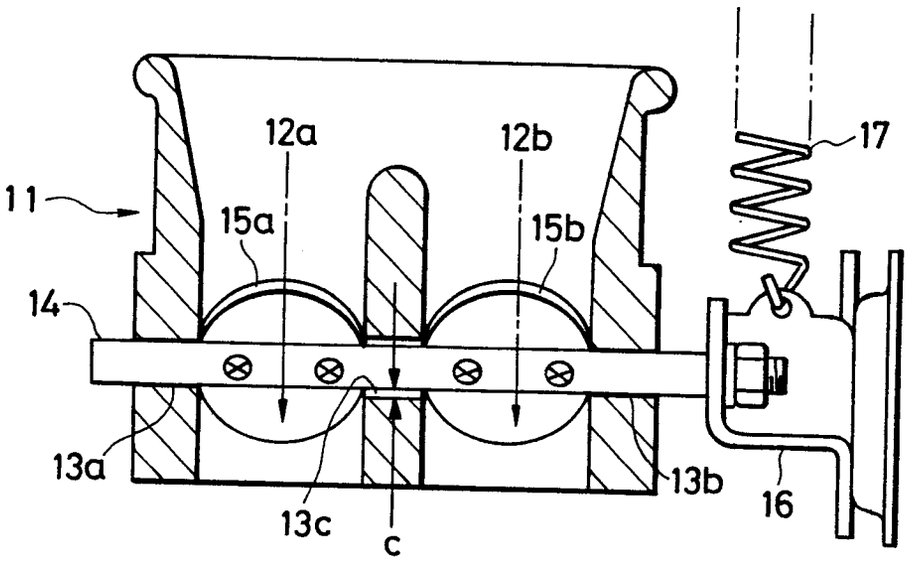

11
12a
12b
17
15a
15b
14
13a
13b
16
13c
c

FIG. 2

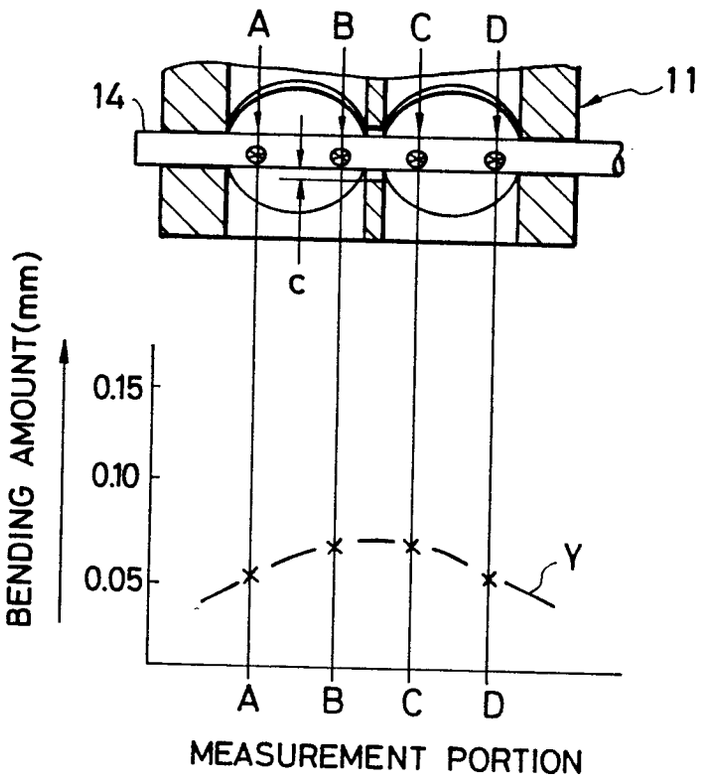

A
B
C
D
14
11
c
BENDING AMOUNT(mm)
0.15
0.10
0.05
Y
A
B
C
D
MEASUREMENT PORTION

FIG. 3

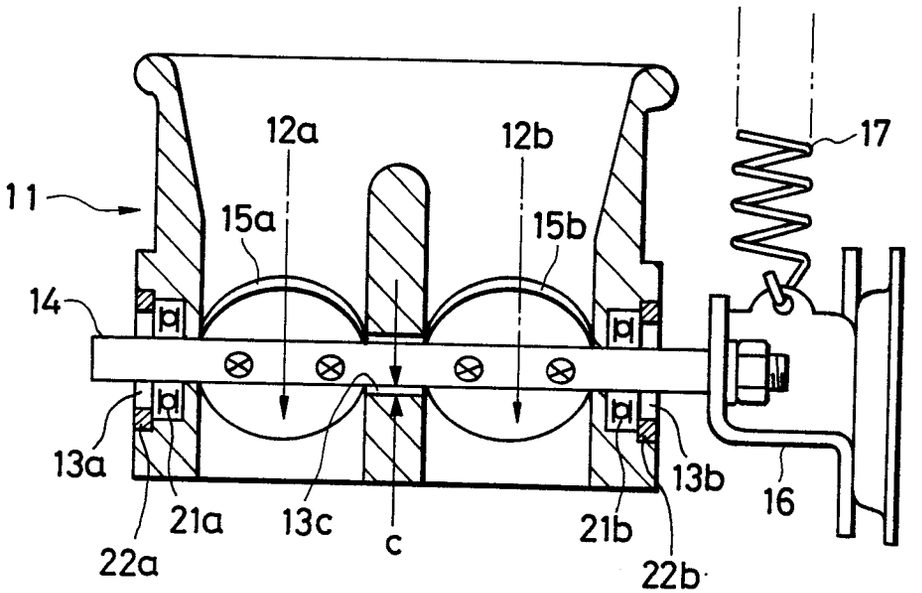


FIG. 4
PRIOR ART