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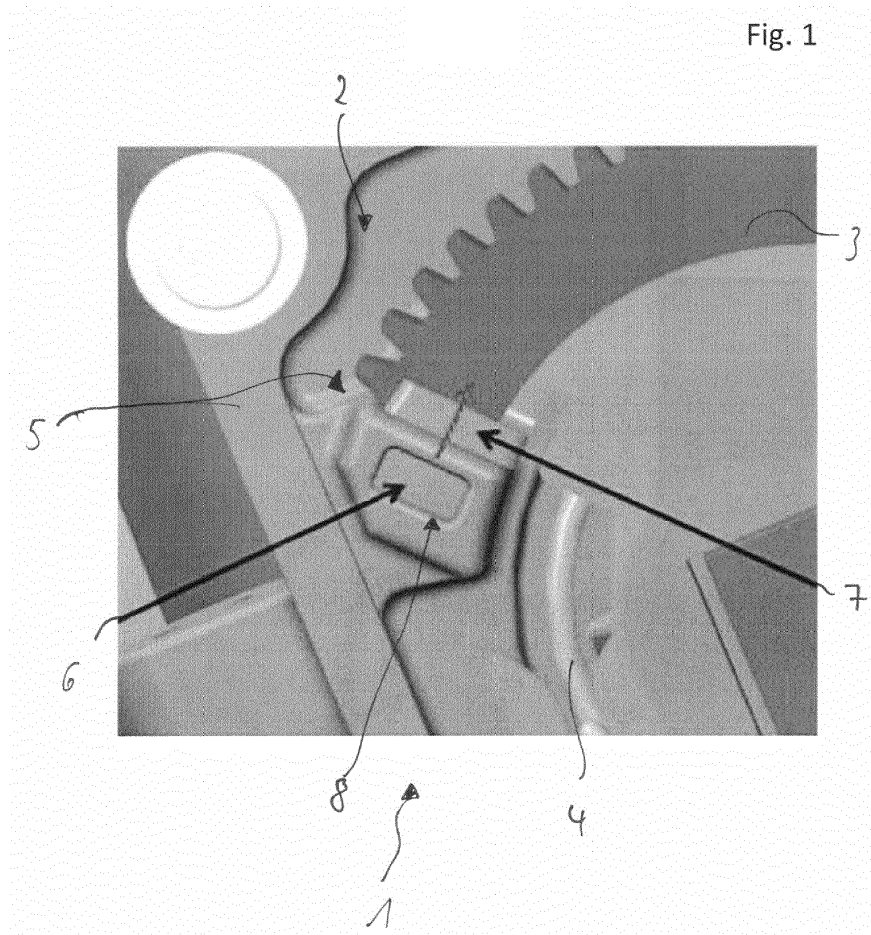
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(54) **VALVE HAVING A THROTTLE FLAP ARRANGED IN A THROTTLE FLAP CONNECTOR**

(57) The invention relates to a valve (1) for regulating a flow cross section in a throttle flap connector, having a throttle flap which is mounted in the throttle flap connector so as to be rotatable about an axis of rotation, wherein the throttle flap is rotatable about the axis of rotation, by

means of an actuator which acts on the throttle flap, counter to a force generated by a mechanical spring (6), wherein the throttle flap, in at least a first position, is fixable in said first position by means of a magnet device (8).

Fig. 1



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Description

Technical field

[0001] The invention relates to a valve for regulating a flow cross section in a throttle flap connector, having a throttle flap which is mounted in the throttle flap connector so as to be rotatable about an axis of rotation, wherein the throttle flap is rotatable about the axis of rotation, by means of an actuator which acts on the throttle flap, counter to a force generated by a mechanical spring.

Prior art

[0002] Throttle flaps are used for example in the intake tract of internal combustion engines for the purposes of regulating the air quantity to be supplied to the combustion chamber. Through the use of a throttle flap, it is possible in particular for the supplied air quantity to be adapted to the supplied fuel quantity, and/or for an air-fuel mixture suitable for the respective load state of the internal combustion engine to be generated.

[0003] Throttle flaps in throttle flap connectors are known. DE 195 12 729 A1 describes a throttle flap connector with a tubular housing in which a throttle flap is fastened to a throttle flap shaft which, at its free ends led through recesses in the housing wall, is mounted so as to be rotatable transversely with respect to the longitudinal axis of the tubular housing.

[0004] Throttle flaps can be rotated in the throttle flap connector by means of an actuator, such as for example an electric motor. As a result of the rotation of the throttle flap relative to the throttle flap connector, the flow cross section of the throttle flap connector can be increased and decreased in size. Often, throttle flaps are designed so as to be held open by a mechanical spring when not acted on by the actuator. Here, the actuator is used to close the throttle flap, through the application of a force, counter to the spring force acting on said throttle flap.

[0005] A disadvantage of devices in the prior art is in particular that the closed position of the throttle flap can be maintained only if the actuator remains energized and thus exerts on the throttle flap a force which counteracts the force imparted by the mechanical spring.

Presentation of the invention, problem, solution, advantages

[0006] Therefore, the problem addressed by the present invention is that of creating a valve having a throttle flap connector and having a throttle flap arranged in said throttle flap connector, which throttle flap can be held in a defined state even in the presence of a reduced action of the actuator or in the absence of action of the actuator.

[0007] The problem is solved, with regard to the valve, by means of a valve having the features of claim 1.

[0008] An exemplary embodiment of the invention relates to a valve for regulating a flow cross section in a

throttle flap connector, having a throttle flap which is mounted in the throttle flap connector so as to be rotatable about an axis of rotation, wherein the throttle flap is rotatable about the axis of rotation, by means of an actuator which acts on the throttle flap, counter to a force generated by a mechanical spring, wherein the throttle flap, in at least a first position, is fixable in said first position by means of a magnet device.

[0009] The valve is formed by a tubular throttle flap connector in which a throttle flap is rotatably mounted. As a result of the rotation of the throttle flap, the cross section, through which flow can pass, of the throttle flap connector can be increased or decreased in size. In the two maximum positions, the throttle flap completely respectively closes the flow cross section of the throttle flap connector or opens up the flow cross section of the throttle flap connector by being rotated so as to be oriented parallel to the main throughflow direction.

[0010] The throttle flap is acted on by a mechanical spring with a force which rotates the throttle flap either toward the open position or toward the closed position. Furthermore, an actuator, for example an electric motor, is provided, which exerts on the throttle flap a force directed counter to the mechanical spring. Depending on the arrangement of the mechanical spring and of the actuator, the throttle flap can be either opened or closed by means of the mechanical spring, wherein the actuator acts in each case in the opposite direction.

[0011] To be able to advantageously fix the throttle flap in a defined first position, a magnet device is provided. Said first position is particularly preferably characterized by the fully closed position of the throttle flap or by the fully open position.

[0012] It is particularly advantageous if the throttle flap is rotatable between two maximum positions, wherein, in the first maximum position, the throttle flap closes the flow cross section of the throttle flap connector, and in the second maximum position, the throttle flap opens up the flow cross section of the throttle flap connector.

[0013] It is also advantageous if the throttle flap, in the first position in which it is fixable by means of the magnet device, completely closes the flow cross section of the throttle flap connector. This is particularly advantageous if the throttle flap is constructed such that the mechanical spring opens the throttle flap and the actuator closes the throttle flap. Here, by means of the magnet device, the throttle flap can be fixed in the closed position even when the actuator exerts no force, or only a reduced force, on the throttle flap.

[0014] In an advantageous embodiment, the throttle flap is fixed by the magnet device in a position which leaves free at least a minimal flow cross section of the throttle flap connector. In this way, it can be ensured that a certain minimum volume can flow through the valve at all times, and thus the downstream internal combustion engine can at all times be operated at least in an emergency running mode.

[0015] A preferred exemplary embodiment is charac-

terized in that the magnet device is formed by an electromagnet which can be activated and deactivated by means of a switching device. An electromagnet is advantageous because the magnetic field action can be generated in targeted fashion by means of the energization or deenergization. Furthermore, through regulation of the current intensity, it is also possible for the magnetic force generated by the electromagnet to be varied.

[0016] It is furthermore expedient if the magnet device is formed by a permanent magnet. Permanent magnets are advantageous because they are inexpensive and generate a constantly definable magnetic field even without external action and energy consumption.

[0017] It is also preferable if the magnet device acts on an adjustment element on the throttle flap, wherein the adjustment element is formed, at least in a partial region, from a magnetic metal. The magnet device is preferably such that a permanent magnet is arranged in positionally fixed fashion on the housing of the throttle flap connector and a magnetic counterpart is arranged on the rotatable throttle flap. This leads to a particularly lightweight throttle flap with a low moment of inertia.

[0018] In an alternative advantageous embodiment, it is also possible for permanent magnets to be arranged both on the throttle flap connector and on the throttle flap, in order to yet further intensify the magnetic field action. The permanent magnets are preferably arranged so as to attract one another.

[0019] It is furthermore advantageous if the magnetic force generated by the magnet device for holding the throttle flap in the first position is at least equal to or greater than the force generated by the mechanical spring. This applies in particular if the magnet device exerts a force which is directed counter to the force of the mechanical spring.

[0020] It is furthermore advantageous if the magnetic force generated by the magnet device is directed counter to the force generated by the mechanical spring. In this way, the magnet device can be utilized for fixing the throttle flap in a predefinable position despite the action of the mechanical spring on the throttle flap.

[0021] The magnetic device may also form a physical stop for the throttle flap, with which stop the throttle flap, or an adjustment means connected thereto, comes into contact when the throttle flap is rotated into the predefined position. The magnetic force assists the fixing and in particular prevents a rotation away from the stop in the opposite direction.

[0022] Alternatively, the fixing of the throttle flap in the predefined position may also be realized entirely by means of the magnetic force, without the throttle flap and the throttle flap connector coming into physical contact with one another.

[0023] Advantageous refinements of the present invention are described in the subclaims and in the following description of the figures.

Brief description of the drawings

[0024] Below, the invention will be discussed in detail on the basis of an exemplary embodiment and with reference to the drawing, in which:

figure 1 shows a perspective view of a cutout of a valve according to the invention, wherein the housing of the throttle flap connector is shown, along with a toothed ring section which is connected to the throttle flap for the purposes of adjusting the latter.

Preferred embodiment of the invention

[0025] Figure 1 shows a sectional view of the valve 1. A part of the housing 2 of the throttle flap connector in which the throttle flap is rotatably mounted is illustrated. The throttle flap is connected to a toothed ring section 3. A toothed wheel of the actuator can engage into the teeth of the toothed ring section 3 and thus transmit the rotational movement of the actuator to the throttle flap.

[0026] Furthermore, a mechanical spring 4 is indicated which is supported with respect to the housing 2 and which acts on the throttle flap.

[0027] The housing 2 has a magnet device 5, which in the exemplary embodiment of figure 1 is formed by a permanent magnet 6, and a magnetic counterpart 7. The permanent magnet 6 is inserted into a cutout 8 in the housing 2. The toothed ring section 3 has a magnetic counterpart 7 to which the magnetic forces of the permanent magnet 6 are transmitted.

[0028] If the toothed ring section 3 and thus the magnetic counterpart 7 are moved toward the permanent magnet 6, a magnetic force acts on the magnetic counterpart 7 and thus on the toothed ring section 3. In the presence of a correspondingly high magnetic force, the magnetic counterpart 7 can be attracted with such intensity that the toothed ring section 3 and thus the throttle flap are fixed. If it is intended for the toothed ring section 3 to be moved away from the permanent magnet 6 again, it is necessary for the toothed ring section 3 and thus the throttle flap to be subjected to a force which overcomes the magnetic attraction force of the permanent magnet 6.

[0029] Depending on the design of the valve 1, the mechanical spring 3 and/or the actuator may act in the same direction as the permanent magnet 6. It is possible for different valves to be realized in a manner dependent on this construction.

[0030] The exemplary embodiment of figure 1 is in particular not of a restrictive nature, and serves for illustrating the concept of the invention.

Claims

1. A valve (1) for regulating a flow cross section in a throttle flap connector, having a throttle flap which is mounted in the throttle flap connector so as to be

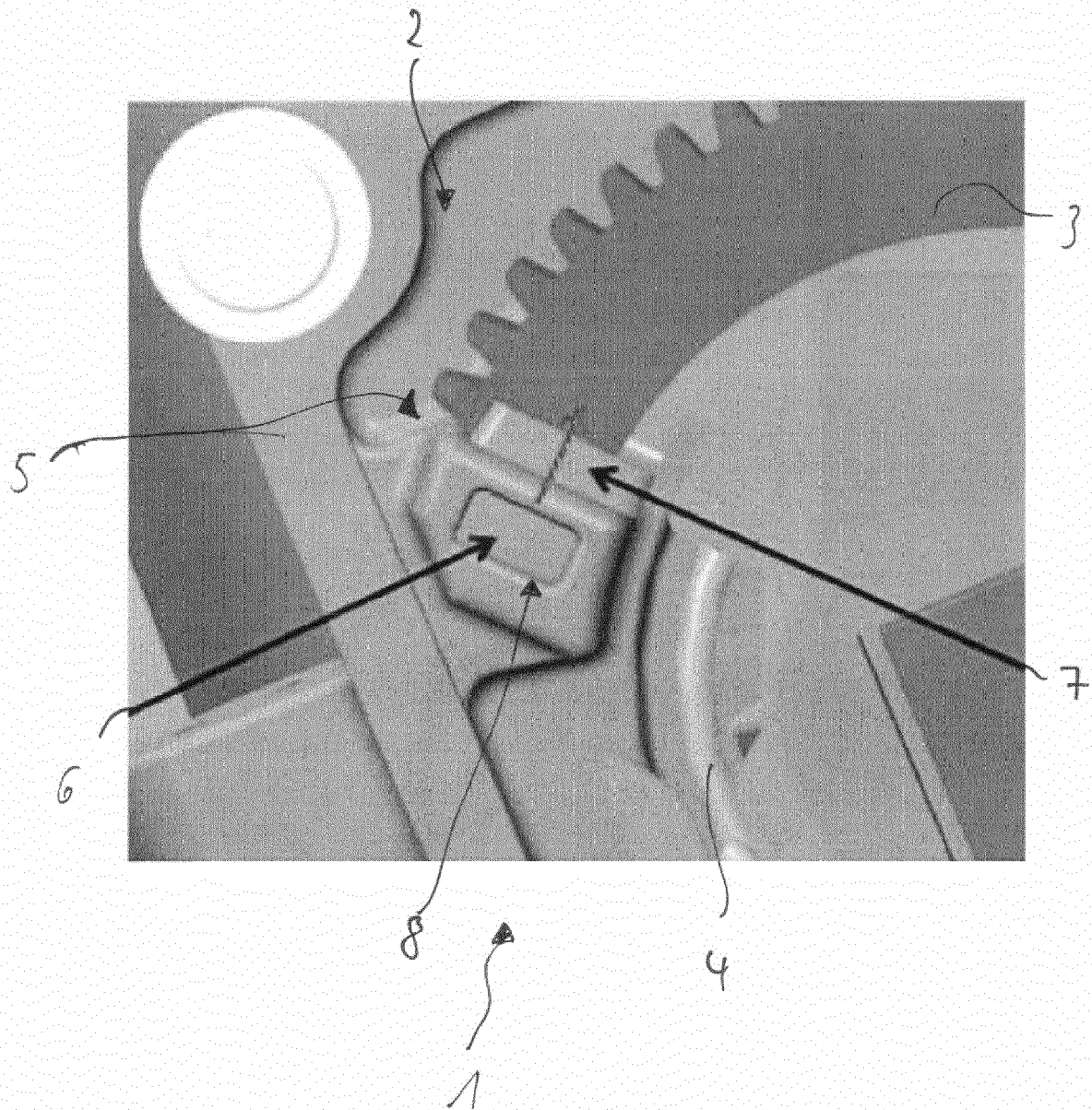
rotatable about an axis of rotation, wherein the throttle flap is rotatable about the axis of rotation, by means of an actuator which acts on the throttle flap, counter to a force generated by a mechanical spring (6), **characterized in that** the throttle flap, in at least a first position, is fixable in said first position by means of a magnet device (8). 5

2. The valve (1) as claimed in claim 1, **characterized in that** the throttle flap is rotatable between two maximum positions, wherein, in the first maximum position, the throttle flap closes the flow cross section of the throttle flap connector, and in the second maximum position, the throttle flap opens up the flow cross section of the throttle flap connector. 10 15
3. The valve (1) as claimed in one of the preceding claims, **characterized in that** the throttle flap, in the first position in which it is fixable by means of the magnet device (5), completely closes the flow cross section of the throttle flap connector. 20
4. The valve (1) as claimed in one of the preceding claims, **characterized in that** the magnet device is formed by an electromagnet which can be activated and deactivated by means of a switching device. 25
5. The valve (1) as claimed in one of the preceding claims, **characterized in that** the magnet device (5) is formed by a permanent magnet (6). 30
6. The valve (1) as claimed in one of the preceding claims, **characterized in that** the magnet device (5) acts on an adjustment element (3) on the throttle flap, wherein the adjustment element (3) is formed, at least in a partial region, from a magnetic metal (7). 35
7. The valve (1) as claimed in one of the preceding claims, **characterized in that** the magnetic force generated by the magnet device (5) for holding the throttle flap in the first position is at least equal to or greater than the force generated by the mechanical spring (4). 40
8. The valve (1) as claimed in one of the preceding claims, **characterized in that** the magnetic force generated by the magnet device (5) is directed counter to the force generated by the mechanical spring (4). 45

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Fig. 1





EUROPEAN SEARCH REPORT

 Application Number
 EP 17 46 5520

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 November 2017	Examiner Raposo, Jorge
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 EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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