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

VENTIL MIT EINER DROSSELKLAPPE, DIE IN EINEM DROSSELKLAPPENVERBINDER
ANGEORDNET IST

SOUPAPE COMPRENANT UN CLAPET D'ÉTRANGLEMENT DISPOSÉ DANS UN CONNECTEUR
DE CLAPET D'ÉTRANGLEMENT

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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, wherein the maximum angle of rotation of the throttle flap in the throttle flap connector is limited by stops.

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 their 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 positioning of the throttle flap in a defined position, for example in a so-called home position or safety position, in which the throttle flap is open to a minimal extent, is possible only with the aid of mechanical stops or with the aid of active elements such as for example actuators.

[0006] US6779775B2 relates to an air flap supply device for the controlled supply of burner air to a combustion engine, wherein a damper flap element, within a damper flap housing element, and connected to a damper flap shaft element can be adjusted by a positioning movement using at least one retraction unit designed as a magnetically homo-polar counter movement unit, wherein, at least two magnet elements with the same magnetic polarity are located opposite to one another, and moveable in relation to each other, preferably in a rotary fashion to

one another.

[0007] DE10143835A1 relates to a valve control device having an adjustment element in a housing movable rotationally or linearly from a rest position to an adjustment position by a drive and a restoring device with two opposing magnetic elements of identical polarity for moving the adjustment element from the adjustment position to the rest position when the drive is turned off. The first magnetic element interacts with the adjustment element and the second magnetic element is mounted in a housing part such that the magnetic force acting between the elements is increased by movement of the adjustment element.

15 Presentation of the invention, problem, solution, advantages

[0008] Therefore, the problem addressed by the present invention is that of creating a throttle flap arranged in a throttle flap connector, which throttle flap serves as a valve for a flow, wherein the throttle flap is fixable in at least one defined position, wherein the fixing is possible in particular even in a deenergized state.

[0009] The problem is solved, with regard to the valve, by means of a valve having the features of claim 1.

[0010] 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 maximum angle of rotation of the throttle flap in the throttle flap connector is limited by stops, wherein the throttle flap, in at least a first position, is fixable in said first position by means of a magnet device, wherein the magnet device is formed by a first permanent magnet in the housing of the throttle flap connector, and a second permanent magnet is formed on the throttle flap, wherein the permanent magnets are oriented relative to one another such that those ends of the permanent magnets which are of the same polarity are directed toward one another.

[0011] The at least first position may vary depending on the construction of the valve and in particular the arrangement and functioning of the mechanical spring and of the actuator. In a first embodiment, the mechanical spring acts on the throttle flap such that the flow cross section of the throttle flap connector is opened up when no force is transmitted from the actuator to the throttle flap. The mechanical spring thus rotates the throttle flap such that the valve is opened. This is advantageous because it is thereby ensured that, even in the event of a failure of the actuator, the throttle flap is opened in order to permit at least emergency operation of a downstream internal combustion engine. In this embodiment, the actuator is used to rotate the throttle flap counter to the mechanical spring such that the flow cross section is de-

creased in size or is closed entirely.

[0012] In a further embodiment, the operating principle of the mechanical spring and of the actuator may be implemented in reverse fashion, whereby the throttle flap is closed by the mechanical spring and is opened by the actuator counter to the action of the mechanical spring.

[0013] In both embodiments, the magnet device can be used in an effective manner. In the first case, the magnet device prevents the throttle flap from being completely closed by the actuator if the force generated by the magnet device in combination with the mechanical spring is greater than that of the actuator. Also, the magnet device may in this case act as a type of stop damper if the force of the actuator is greater than that of the magnet device.

[0014] In the second case, the magnet device may contribute to a situation in which the throttle flap rotated by the mechanical spring in the direction of a closed position is not fully closed if the force of the magnet device is greater than that of the mechanical spring. Here, the throttle flap is at all times held in a position in which at least a minimal flow cross section of the throttle flap connector remains open. Such a position is known for example as a rest position or emergency position, because it ensures a certain minimum functionality of the valve even in the event of failure of the actuator, because at least a minimal flow cross section remains for a passage of flow.

[0015] The magnet device may advantageously also be integrated into the valve so as to act as a stop damper even in the open position of the throttle flap.

[0016] It is particularly advantageous if the throttle flap, in the first position, opens up a defined flow cross section in the throttle flap connector. This is advantageous for ensuring a certain minimum throughput through the valve at all times. In the case of a completely closed throttle flap, it would not be possible for any air mixture to be supplied to the internal combustion engine, whereby operation would be rendered impossible.

[0017] It is also advantageous if the flow cross section of the throttle flap connector can be reduced in size by the throttle flap by means of the mechanical spring counter to the force that can be generated by the actuator, wherein the magnet device prevents a complete closure of the flow cross section of the throttle flap connector. This is advantageous because, in such an embodiment, the magnet device ensures that the throttle flap cannot be rotated into a fully closed position.

[0018] A preferred exemplary embodiment is characterized in that at least one of the permanent magnets is surrounded by means for directing the magnetic field, wherein said means are formed by metal plates which at least partially enclose the permanent magnets. Such means for directing the magnetic field are advantageous because, by means of these, the action of the respective permanent magnets can be improved. As a result of the directing of the magnetic field, the force of the permanent magnets can be considerably increased, whereby, with

an unchanged magnet size, greater forces can be generated, or alternatively, smaller permanent magnets can be used.

[0019] It is also preferable if the means for directing the magnetic field are formed by steel plates. Steel plates are, owing to their material characteristics, particularly well-suited for directing magnetic field lines.

[0020] It is furthermore advantageous if the second permanent magnet arranged on the throttle flap is movable on a circular path formed around the axis of rotation of the throttle flap, wherein the spacing between the first permanent magnet and the second permanent magnet in a circumferential direction along the circular path is defined by the angle of rotation of the throttle flap relative to the throttle flap connector. This is advantageous for ensuring that the permanent magnets are moved toward one another or away from one another as a result of the rotation of the throttle flap, whereby the function of said permanent magnets is ensured.

[0021] It is furthermore advantageous if the second permanent magnet is part of the toothed ring by means of which the movement of the actuator can be transmitted to the throttle flap. This is advantageous because the movement of the throttle flap thus leads directly to a movement of the permanent magnet.

[0022] It is also expedient 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. The throttle flap is advantageously designed such that complete closure of the throttle flap is prevented in order that a minimum functionality of the valve is maintained even in the event of a defect, for example in the event of failure of the actuator.

[0023] It is also advantageous if the throttle flap, in the first position in which it is fixable by means of the magnet device, incompletely closes the flow cross section of the throttle flap connector and holds a minimum flow cross section open. This is advantageous for ensuring that, even in the event of a defect, a minimum quantity of air can pass into the combustion chamber of the downstream internal combustion engine and thus ensure at least emergency operation. This applies in particular to an embodiment of the valve in which the mechanical spring would lead to complete closure of the throttle flap in the event of failure of the actuator.

It is furthermore expedient if the 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 is advantageous for ensuring that the throttle flap would not be pushed into a fully closed position counter to the magnetic forces.

It is furthermore advantageous if the two permanent magnets are arranged on a common circular path, wherein the first permanent magnet is connected positionally fixedly to the housing of the throttle flap connector, and the

second permanent magnet is rotatable with the throttle flap along the circular path. In this way, it is ensured that the magnets are moved toward one another or away from one another in controlled fashion as a result of the rotation of the throttle flap.

[0024] It is a feature of the invention if the force generated by the magnet device between the permanent magnets of the throttle flap and of the throttle flap connector counteract the force generated by the actuator. This is advantageous if the valve is designed such that the mechanical spring opens the throttle flap and the actuator acts counter to this. The actuator thus closes the throttle flap as far as a point at which the closing force of the actuator is equal to the repelling forces between the two permanent magnets. Advantageous refinements of the present invention are described in the subclaims and in the following description of the figures.

Brief description of the drawings

[0025] 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 detail of the valve according to the invention, wherein the upper part of the figure shows the two permanent magnets, and the lower part of the figure is a schematic illustration of the magnetic field generated by the permanent magnets.

Preferred embodiment of the invention

[0026] Figure 1 shows, in the upper part, a detail view of the valve 1, wherein the illustration shows substantially the housing 2 of the throttle flap connector, the mechanical spring 3 and the toothed ring section 4 which transmits the movement of the actuator (not shown) to the throttle flap (likewise not shown).

[0027] A permanent magnet 5 is arranged at the free end region of the toothed ring section 4. A further permanent magnet 7 is arranged in a receptacle 6 of the housing 2.

[0028] The two permanent magnets 5 and 7 are oriented relative to one another such that in each case the identical magnetic poles point toward one another. This has the effect that the two permanent magnets 5 and 7 repel one another when they are moved close enough to one another.

[0029] The toothed ring section 4 is rotated by an actuator in order to move the throttle flap that is attached to the toothed ring section 4. Here, the throttle flap and the toothed ring section 4 preferably rotate about a common axis of rotation. The permanent magnet 5 thus moves on a circular path defined by the toothed ring section 4. The second permanent magnet 7 is preferably likewise arranged on said circular path in order to ensure that the two permanent magnets 5, 7 can be moved to-

ward one another or away from one another as a result of the rotation of the throttle flap.

[0030] If the two permanent magnets 5, 7 have been moved close enough to one another, they repel one another owing to the orientation of the permanent magnets 5, 7, and thus generate a spacing between themselves. The toothed ring section 4 and thus the attached throttle flap are thereby fixed in a position.

[0031] Depending on the construction of the valve and in particular on the direction of action of the mechanical spring 3 and of the force imparted by the actuator, it is thus possible for the throttle flap to be fixed in a slightly open position or in a fully open position.

[0032] The force generated by the repulsion of the permanent magnets 5, 7 may be used both for opening the throttle flap and for closing the latter. This is dependent substantially on the directions of action of the actuator and of the mechanical spring 3.

[0033] The magnet device 5, 7 may also be used as a stop damper if the force component that moves the toothed ring section in the direction of the second permanent magnet 7 is correspondingly dimensioned so as to overcome the repulsion force. In such a situation, the toothed ring section 4 is braked by the repulsion force and is moved as far as a physical stop by the relatively high actuation force counter to the repulsion action.

[0034] If the repulsion force is greater than the actuation force that the toothed ring section 4 imparts to the second permanent magnet 7, the movement of the toothed ring section 4 is ended, possibly with slight overshoots, before the toothed ring section 4 abuts against the housing 1.

[0035] Depending on the manner in which the individual force components of the mechanical spring 3, of the actuator and of the magnetic repulsion are directed and thus act on the throttle flap, corresponding functionality can be realized. Here, the common functionalities include stop damping and fixing in a defined position, in which the throttle flap is at least slightly open.

[0036] The lower part of figure 1 shows a diagrammatic sketch of two permanent magnets, showing the arrangement of the equal magnetic poles toward one another. The permanent magnets 5, 7 in the upper part of figure 1 are arranged in the same manner as in the diagrammatic sketch.

[0037] 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 (3), wherein the maximum angle of rotation of the throttle flap in the throttle flap connector is limited by stops, wherein the throttle flap, in at least a first position, is fixable in said first position by means of a magnet device (5, 7), wherein the magnet device (5, 7) is formed by a first permanent magnet (5) in the housing (2) of the throttle flap connector, and a second permanent magnet (7) is formed on the throttle flap, wherein the permanent magnets (5, 7) are oriented relative to one another such that those ends of the permanent magnets (5, 7) which are of the same polarity are directed toward one another, wherein the force generated by the magnet device (5, 7) between the permanent magnets (5, 7) of the throttle flap and of the throttle flap connector counteract the force generated by the actuator.

2. The valve (1) as claimed in claim 1, **characterized in that** the throttle flap, in the first position, opens up a defined flow cross section in the throttle flap connector.
3. The valve (1) as claimed in one of the preceding claims, **characterized in that** the flow cross section of the throttle flap connector can be reduced in size by the throttle flap by means of the mechanical spring (3) counter to the force that can be generated by the actuator, wherein the magnet device (5, 7) prevents a complete closure of the flow cross section of the throttle flap connector.
4. The valve (1) as claimed in one of the preceding claims, **characterized in that** at least one of the permanent magnets (5, 7) is surrounded by means for directing the magnetic field, wherein said means are formed by metal plates which at least partially enclose the permanent magnets (5, 7).
5. The valve (1) as claimed in claim 4, **characterized in that** the means for directing the magnetic field are formed by steel plates.
6. The valve (1) as claimed in one of the preceding claims, **characterized in that** the second permanent magnet (7) arranged on the throttle flap is movable on a circular path formed around the axis of rotation of the throttle flap, wherein the spacing between the first permanent magnet (5) and the second permanent magnet (7) in a circumferential direction along the circular path is defined by the angle of rotation of the throttle flap relative to the throttle flap connector.
7. The valve (1) as claimed in one of the preceding claims, **characterized in that** the second permanent magnet (7) is part of the toothed ring (4) by means of which the movement of the actuator can be trans-

mitted to the throttle flap.

8. 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, 7), incompletely closes the flow cross section of the throttle flap connector and holds a minimum flow cross section open.
9. The valve (1) as claimed in one of the preceding claims, **characterized in that** the force generated by the magnet device (5, 7) for holding the throttle flap in the first position is at least equal to or greater than the force generated by the mechanical spring (3).
10. The valve (1) as claimed in one of the preceding claims, **characterized in that** the two permanent magnets (5, 7) are arranged on a common circular path, wherein the first permanent magnet (5) is connected positionally fixedly to the housing (3) of the throttle flap connector, and the second permanent magnet (7) is rotatable with the throttle flap along the circular path.

Patentansprüche

1. Ventil (1) zum Regulieren eines Strömungsquerschnitts in einem Drosselklappenverbinder, mit einer Drosselklappe, die so im Drosselklappenverbinder montiert ist, dass sie um eine Drehachse drehbar ist, wobei die Drosselklappe mit Hilfe eines auf die Drosselklappe wirkenden Aktuators gegen eine durch eine mechanische Feder (3) erzeugte Kraft um die Drehachse drehbar ist, wobei der maximale Drehwinkel der Drosselklappe im Drosselklappenverbinder durch Anschläge begrenzt ist, wobei die Drosselklappe in zumindest einer ersten Position mit Hilfe einer Magnetvorrichtung (5, 7) in der ersten Position fixierbar ist, wobei die Magnetvorrichtung (5, 7) durch einen ersten Dauermagneten (5) im Gehäuse (2) des Drosselklappenverbinders ausgebildet ist und wobei ein zweiter Dauermagnet (7) an der Drosselklappe ausgebildet ist, wobei die Dauermagneten (5, 7) relativ zueinander so ausgerichtet sind, dass diejenigen Enden der Dauermagneten (5, 7), die von gleicher Polarität sind, einander zugewandt sind, wobei die durch die Magnetvorrichtung (5, 7) zwischen den Dauermagneten (5, 7) der Drosselklappe und des Drosselklappenverbinders erzeugte Kraft der durch den Aktuator erzeugten Kraft entgegengerichtet wirkt.
2. Ventil (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Drosselklappe in der ersten Position einen definierten Strömungsquerschnitt im Drosselklappenverbinder öffnet.

3. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Strömungsquerschnitt des Drosselklappenverbinders durch die Drosselklappe mit Hilfe der mechanischen Feder (3) entgegen der Kraft, die durch den Aktuator erzeugt werden kann, verkleinert werden kann, wobei die Magnetvorrichtung (5, 7) ein vollständiges Schließen des Strömungsquerschnitts des Drosselklappenverbinders verhindert. 5
4. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest einer der Dauermagneten (5, 7) von Mitteln zum Richten des magnetischen Felds umgeben ist, wobei die Mittel durch Metallplatten ausgebildet sind, die die Dauermagneten (5, 7) zumindest teilweise umschließen. 10
5. Ventil (1) nach Anspruch 4, **dadurch gekennzeichnet, dass** die Mittel zum Richten des magnetischen Feldes durch Stahlplatten ausgebildet sind. 15
6. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der an der Drosselklappe angeordnete zweite Dauermagnet (7) auf einer um die Drehachse der Drosselklappe ausgebildeten Kreisbahn bewegbar ist, wobei der Abstand zwischen dem ersten Dauermagneten (5) und dem zweiten Dauermagneten (7) in einer Umfangsrichtung entlang der Kreisbahn durch den Drehwinkel der Drosselklappe relativ zum Drosselklappenverbinder definiert ist. 20 25 30
7. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweite Dauermagnet (7) Teil des Zahnriings (4) ist, mit dessen Hilfe die Bewegung des Aktuators auf die Drosselklappe übertragbar ist. 35
8. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Drosselklappe in der ersten Position, in der sie mit Hilfe der Magnetvorrichtung (5, 7) fixierbar ist, den Strömungsquerschnitt des Drosselklappenverbinders unvollständig verschließt und einen minimalen Strömungsquerschnitt offenhält. 40 45
9. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die durch die Magnetvorrichtung (5, 7) erzeugte Kraft zum Halten der Drosselklappe in der ersten Position mindestens so groß wie oder größer als die durch die mechanische Feder (3) erzeugte Kraft ist. 50
10. Ventil (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die beiden Dauermagneten (5, 7) auf einer gemeinsamen Kreisbahn angeordnet sind, wobei der erste Dauer-

magnet (5) ortsfest mit dem Gehäuse (3) des Drosselklappenverbinders verbunden ist und der zweite Dauermagnet (7) mit der Drosselklappe entlang der Kreisbahn drehbar ist.

Revendications

1. Soupape (1) pour réguler une section transversale d'écoulement dans un connecteur à clapet d'étranglement, comportant un clapet d'étranglement qui est monté dans le connecteur à clapet d'étranglement afin de pouvoir tourner autour d'un axe de rotation, le clapet d'étranglement pouvant tourner autour de l'axe de rotation au moyen d'un actionneur qui agit sur le clapet d'étranglement à l'encontre d'une force générée par un ressort mécanique (3), l'angle de rotation maximal du clapet d'étranglement dans le connecteur à clapet d'étranglement étant limité par des arrêts, le clapet d'étranglement, dans au moins une première position, pouvant être fixé dans ladite première position au moyen d'un dispositif magnétique (5, 7), le dispositif magnétique (5, 7) étant formé par un premier aimant permanent (5) dans le boîtier (2) du connecteur à clapet d'étranglement, et un deuxième aimant permanent (7) étant formé sur le clapet d'étranglement, les aimants permanents (5, 7) étant orientés l'un par rapport à l'autre de telle sorte que les extrémités des aimants permanents (5, 7) qui sont de la même polarité soient dirigées l'une vers l'autre, la force générée par le dispositif magnétique (5, 7) entre les aimants permanents (5, 7) du clapet d'étranglement et du connecteur à clapet d'étranglement allant à l'encontre de la force générée par l'actionneur.
2. Soupape (1) selon la revendication 1, **caractérisée en ce que** le clapet d'étranglement, dans la première position, ouvre une section transversale d'écoulement définie dans le connecteur à clapet d'étranglement.
3. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la section transversale d'écoulement du connecteur à clapet d'étranglement peut être réduite en taille par le clapet d'étranglement au moyen du ressort mécanique (3) à l'encontre de la force qui peut être générée par l'actionneur, le dispositif magnétique (5, 7) empêchant une fermeture complète de la section transversale d'écoulement du connecteur à clapet d'étranglement.
4. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au moins** un des aimants permanents (5, 7) est entouré par des moyens pour diriger le champ magnétique, lesdits moyens étant formés par des plaques métalli-

ques qui entourent au moins partiellement les aimants permanents (5, 7).

5. Soupape (1) selon la revendication 4, **caractérisée en ce que** les moyens pour diriger le champ magnétique sont formés par des plaques en acier. 5

6. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le deuxième aimant permanent (7) agencé sur le clapet d'écoulement peut être déplacé sur un chemin circulaire formé autour de l'axe de rotation du clapet d'étranglement, l'espacement entre le premier aimant permanent (5) et le deuxième aimant permanent (7) dans une direction circonférentielle le long du chemine circulaire étant défini par l'angle de rotation du clapet d'étranglement par rapport au connecteur à clapet d'étranglement. 10
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7. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le deuxième aimant permanent (7) fait partie de l'anneau denté (4) au moyen duquel le mouvement de l'actionneur peut être transmis au clapet d'étranglement. 20
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8. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le clapet d'étranglement, dans la première position dans laquelle il peut être fixé au moyen du dispositif magnétique (5, 7), ferme de manière incomplète la section transversale d'écoulement du connecteur à clapet d'étranglement et maintient ouverte une section transversale d'écoulement minimale. 30
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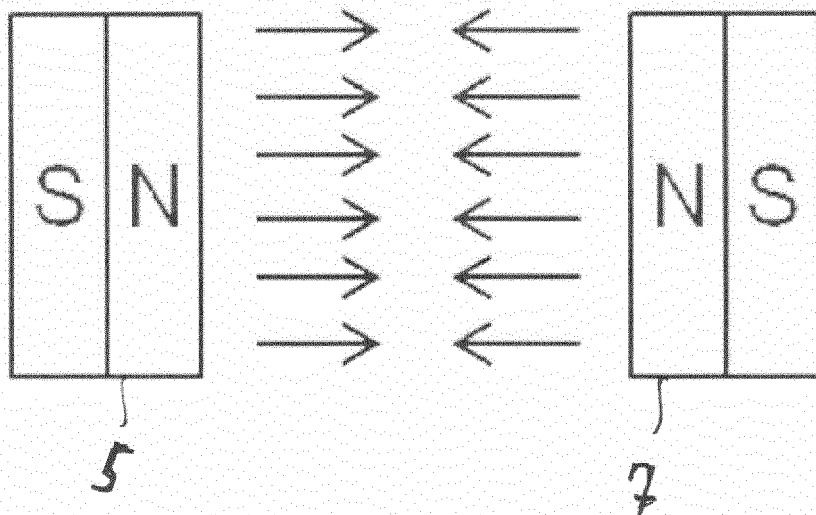
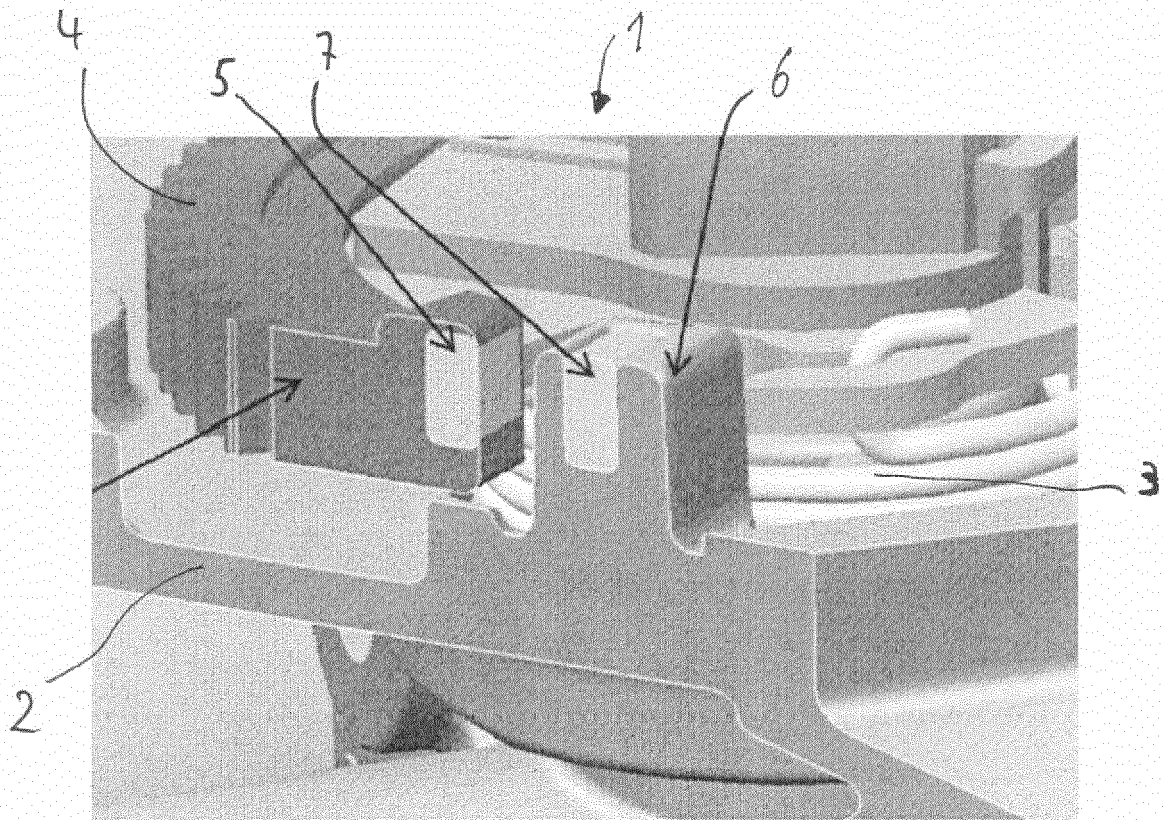
9. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la force générée par le dispositif magnétique (5, 7) pour maintenir le clapet d'étranglement dans la première position est au moins égale ou supérieure à la force générée par le ressort mécanique (3). 40

10. Soupape (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les deux aimants permanents (5, 7) sont agencés sur un chemin circulaire commun, le premier aimant permanent (5) étant connecté à une position fixe au boîtier (3) du connecteur à clapet d'étranglement, et le deuxième aimant permanent (7) pouvant tourner avec le clapet d'étranglement le long du chemin circulaire. 45
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Fig. 1



REFERENCES CITED IN THE DESCRIPTION

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