(54) Title: VALVE WITH ACTUATOR

(57) Abstract: Device for flow control of a medium in a heating and cooling system where the device is a complete regulating valve (1), which comprises an actuator (10) that is arranged to axially move both a first throttling device in the form of an inner cone (13) and a second throttling device in the form of an outer cone (15), in direction to and from the valve seat (6) of the control valve.

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Description

Title of Invention: VALVE WITH ACTUATOR

Technical Field

[1] Present invention relates to a device for controlling the flow quantity of a medium in a heating or cooling system and where the device is a control valve, preferable a presettable control valve, comprising an actuator, preferable a valve handle, which is arranged to axially move both a first throttle device in the form of an inner cone, and a second throttle device in the form of an outer cone, in direction to respective from the valve seat of the control valve.

Background Art

[2] At the present there exists a number of different valve types in the technique of heating, ventilation and sanitary, with different objects/functions such as shut off valves, adjustment valves and control valves. The majority of these are provided with some art of valve handle or the like and it is well known that those preferable are provided with different scales or indications for indicating the setting and so forth. Examples of this can for instance be seen in SE 522 422. To minimize the number of components in the system and consequently reduce the costs of the installation and also the operation of the system since less components results in a lower totally fall in pressure, it is appropriate to combine several functions in one and the same valve. In some cases there are combined functions in one and the same valve, for instance in US 20090199905 A1, where a presetting of the Kvs-value of a valve and also controlling of the fluid flow through the valve, is combined. The presetting of the Kvs-value means that the maximal fluid flow that will be able to flow through the valve is determined. In the mentioned combination the valve preferable can be referred to as a presettable control valve. According to the device in US 20090199905 A1 the Kvs-value of the control valve is preset by that the valve handle is rotated, whereby a cone with machined flank, which flank is altered along the periphery of the cone, is rotating and cooperates at the same time with a veil in a way that a desired part of the flank is exposed for presetting of the maximal flow through the valve, i.e. the Kvs-value. The valve handle in this solution is only a presetting tool, which, after the presetting is performed, is removed from the valve.

Disclosure of Invention

Technical Problem

[3] The prior solutions have a number of disadvantages. One disadvantage is that there is a need of special presetting tools in form of Allen keys, special handles or the like for example for the presetting of the valve. At first these must be delivered separately by
the delivering of the valves, and must, after the system is put into operation, with for instance performed presetting of the control valve, be kept and stored until the next time an adjustment of the operating settings is needed. Another disadvantage is that when the type of valve is a control valve, the same is often provided with a motorized throttle actuator which is mounted thereon, and in that case the presetting has to be done before the actuator is mounted, and this must accordingly be done on place in the plant by putting into operation and not until then the actuator can be mounted on the valve. Older solutions also have the disadvantage that several different actuators is needed to achieve several different functions, for instance presetting and shutting off, i.e. one actuator for each function. Moreover those actuators are handled in different ways, for example they are rotated or displaced, to achieve corresponding rotating respective displacing motions of the throttling devices of the valves, which devices are provided for the respective function. For example there are solutions where a particular presetting tool is actuated to achieve an axial motion of a throttling device, while a valve handle is actuated to rotate/turn another throttling device, for example a ball or a veil to close the valve flow through the valve.

Solution to Problem

Technical Solution

[4] In the present invention the above problem is solved by that the presettable control valve is provided with only one actuator, which is arranged to move both a first throttle device in the shape of an inner cone, and a second throttle device in the shape of an outer cone, axially in direction to respective from the valve seat of the control valve. This is hence achieved with only one actuator and only with one kind of movement, preferable rotation of the actuator. By that the advantage is obtained that only one actuator need to be handled to achieve all functions of the valve, and that the handling of said actuator always is done in the same way, preferable rotation, to achieve all functions.

[5] According to a preferred embodiment of the invention both throttling devices, the inner cone and the outer cone, are moved axially towards the valve seat, when the actuator is rotated in a first operating position, which is the shut off position of the control valve. When the flow through opening of the valve is totally shielded by the outer cone for fluid flow, the fluid flow through the valve is discontinued. Since both the inner and the outer cones is moved at the same time in this position, the presetting of the valve will not be influenced of the closing motion, which is an advantage, because the valve do not need to be preset once again after it has been shut off.

[6] By rotating the actuator in a preferred second operating position, which is the preset position of the control valve, only the inner cone is moved axially in direction to or
from the valve seat, whereby the valve is preset. This second operating position is clear and distinct separated from the first operating position so that the operator will know for certain that the actuator by rotation in this second position only performs the function presetting. The advantage compared to older solutions is still that with one and the same actuator and with the same handling, that is to say rotation, all functions of the control valve can be performed.

[7] In a preferred embodiment the actuator is displaceable arranged between different positions, in which different functions can be performed. The actuator is preferable arranged around the spindle of the valve, but free axially movable and rotatable relative the same. A valve spindle is an axis where the regulating detail, usually a cone, is coordinated with a throttle actuator, mounted on the control valve, for motorizing the control function of the valve. The functions that are performed in the different positions are according to the preferred embodiment normal position/control position, presetting and shutting off, but are not limited only to comprise those functions; they can be completely other functions, depending on the need and on the type of valve. According to the invention the actuator is preferable mounted at the factory and is arranged in a way that it never need to be removed from the valve, apart from if it will be provided with an actuator or not. Accordingly the "tool" is always arranged on the valve by delivery, at the putting into service and forever. The advantages in that case are that the operating staff don’t need to spend time for searching disappeared tools of all possible different variants and moreover also that the handling/operating of the valve is facilitated when all functions can be performed with one and the same actuator. In addition it is also possible at the same time to deliver an affixed actuator, mounted under industrial efficiency instead of being controlled by one at the montage performed on place, with increased costs for the installation and worse working environmental conditions. The time for installation is accordingly considerably shortened. The embodiment is not limited to comprise only this type of control valves, it can preferable be applied on a number of different types of valves where a stationary tool is desired provided for different functions.

[8] According to a further preferred embodiment of the invention the actuator is rotatable in every position along its axis of rotation, in and between the end positions of the actuator. This means that the number of functions is not limited by the possible positions of the actuator, the valve itself can be provided with the number of functions that is technical possible from the valve constructive point of view and of what is needed. Normally and at the present the need of functional positions is in most cases about 2-3, but the invention is not limited to this number, the functional positions can be more. Usually older solutions comprise one functional position where the presetting tool is used.
According to a preferred embodiment the invention comprises two functional positions, a first farther end position relative the valve body, and a second end position, closest to the valve body. The actuator is in this case displaceable between those two end positions and rotatable in every position. Thus, with one and the same actuator, which in addition, according to mentioned above, always is in readiness, two functional positions are obtained, in which an optional function can be comprised.

According to a preferred embodiment the invention comprises a resilient means, preferable a reset spring. In its mounted position the resilient means has a clamped force directed mainly towards the first farther end position of the actuator relative the valve body and which force is transmitted either direct or indirect to the actuator. Accordingly the actuator always returns to its first farther end position, which also can be named as its initial position or normal position. In this way it is secured that the function provided in this initial position or normal position always is accessible, except when a larger, opposite directed force acts on the actuator, for example pressing in of the actuator in direction to the valve body by hand. In the same way the advantage is obtained that this first farther position will be distinct and the "operator" know for certain that the control valve stands in its first functional position, whereupon the actuator for example is rotated and the function is performed in one or another way.

According to a further embodiment the actuator is only displaceable to its second end position, closest to the valve body, by an applied external axial force, mainly towards the valve body. This force is of practical reasons often in the form of hand-power where the "operator" pushes the actuator in direction to the valve body, and when the end position is reached the provided function is accessible, and the actuator is preferable rotated in this position to perform the function. Some known solutions suffer from problems to find the correct position, for instance for the presetting tool, and it can be difficult to be reached in a correct angle, with for example an Allen key and moreover it can be difficult to see what is done. In combination with poor lighting around the control valve it is yet more difficult to perform the moments. By the two distinct positions of the invention those difficulties are set aside.

In a preferred embodiment of the invention the first farther end position of the actuator relative the valve body comprises the control position of the complete control valve. In this position the actuator is free movable and rotatable relative the valve spindle, which makes it possible to control the valve when the actuator is in this position. A motorized actuator, which is mounted on the control valve, is engaged with the valve spindle and the actuator communicates with sensors in the fluid system and receives signals whether the load/power extraction varies in the part that is controlled by the current control valve, after which the throttle actuator acts on the spindle to be moved axially in direction to or from the valve seat, depending on if the need of flow is
increasing or decreasing. The spindle in turn is engaged with the cone that controls the valve, the inner cone, which is provided to control the flow through the valve. According to the invention the control is done by that the inner cone comprises an opening with a certain geometry, which opening cooperates with the valve seat that shields the opening more or less depending on the load. In the first farther end of the actuator, i.e. the control position of the complete control valve, the actuator is in a state of rest. The actuator is used only at the occasions when a manual handling is needed, in connection with putting into operation, overhauling or for example shutting off the entire plant or parts of the plant.

In a preferred embodiment of the invention the second end position of the actuator, closest to the valve body, comprises the presetting position of the complete control valve. In this position the actuator is also free moveable and rotatable relative the valve spindle, whereby the valve spindle is not affected by the motion and rotation of the actuator. By pressing the actuator in direction to the valve body, to its end position in this direction, the actuator comes in engagement with cooperating parts in the valve body and the valve neck whereby a rotary motion of the actuator in this position is converted to an axial motion at the inner cone, which is arranged to be preset in a position relative the valve seat, resulting in that a desired maximal fluid through the valve, i.e. a desired Kvs-value, is obtained. By that a preferred form of the device comprises a clamped force, preferable a reset spring, which acts on the actuator, the actuator always returns to its first farther end position, its normal position after the pressing force is removed. One advantage with this way of arrangement is that the position for presetting is very distinct, since it is an end position, in which an actuator that easy can be gripped is provided to perform the function instead of, as in prior solutions, a use of Allen keys or the like.

In a preferred embodiment of the invention the first farther end position of the actuator relative the valve body, also comprises the complete shut off position of the complete control valve. In this position, which is described before, the actuator is free moveable and rotatable relative the valve spindle, which makes the controlling of the valve possible when the actuator is in this position. By that the actuator in this positions grips in cooperating parts in the valve body and the valve neck, a rotator motion of the actuator is transmitted in this first farther end position to the cooperating parts, resulting in that these acts on an outer cone arranged in the valve neck. The outer cone is displaceable arranged in the valve neck between a position at a distance from the valve seat and another position in connection to the valve seat and when the actuator is rotated in its first farther position the motion is transmitted to the outer cone which is displaced in axial direction to the valve seat to finally totally shield both the opening of the inner cone and the flowing through opening in the valve body. Because
the actuator preferable comprises a reset spring or the like which sees to that the actuator returns to this first farther end position when no extern force (hand force) acts on it, the shutting off function is always accessible at the complete control valve, in this position. Accordingly the valve must not be set manually in this position to be able to perform this function and the valve is always possible to be totally closed for flow through of fluid, independent of if it is provided with an actuator or not.

According to a preferred embodiment of the invention the actuator is preferable a valve handle, the valve handle itself is well known in all forms of valves in the technique of heating, ventilation and sanitary installations which is advantageous for the adjustment or operational staff who in this case are well known with this tool and how it is handled. Prior solutions have, as is mentioned before, diverse different types of more or less specific manufactured tools for instance presetting of the Kvs-value or other functions. Those tools often have to be lead-in in an assigned groove, sleeve or other assignments, not seldom partly hidden or hard to reach. While the valves mostly is mounted on tube lines in false ceilings or in shafts the illumination is poor around the valve which in addition makes a use of special tools or Allen keys or the like more difficult where the adjustment or operating staff in that case will try to find the right position for the tool. A reliable an easy to grip valve handle makes it more clear and easy to adjust the valve and this valve handle is preferable provided with some sort of scale or another distinct indication that shows the functional positions or settings of the valve.

**Advantageous Effects of Invention**

**Advantageous Effects**

Accordingly, both prior known advantages are obtained together with the new advantages and in one and the same valve the following is obtained:

- One single actuator for all functions in the valve, which in the preferred embodiment are presetting, shutting off and control.
- The presetting of the valve isn’t changed by the shutting off of the fluid flow through the valve.
- One single actuator/tool which preferable is mounted on the valve by deliver, during operation and during the whole life of the valve.
- Faster installation and improved installation ergonomics and, accordingly, lower costs for the installation because the presetting tool or the shutting off tool or the actuator is always mounted, and also that the valve by advantage also is delivered with mounted actuator.

The constructive design of the present invention is in detail described below. Moreover the invention brings the prior art further in different respects. This is realized
in the present invention by that an arrangement of the art described below preferable is constituted in a way that is evident from the characterizing part of claim 1. Additionally characteristics of and advantages with the invention are evident from the following description referring to the attached drawings, showing a preferred, but not limiting embodiment of the invention.

Brief Description of Drawings

Brief description of the drawings

[18] In detail represents in diametrical, partly schematic cross-sections or perspective views:
- Figure 1 shows the actuator in its first, farther end position (a), relative the valve body.
- Figure 2 shows the actuator in its second end position (b), closest to the valve body.

Detailed description of the drawings

[19] Figure 1 shows an example of a complete valve assembly 1 provided with an actuator 2 where the valve assembly 1 is connected to a valve 3 via measuring hoses 4 to the measuring nipples 5 of the valve. The figure also includes a manual unit 6 for preferable wireless communication with the actuator 2 and, where appropriate, communication with a computer or a computer system.

[20] Figure 1 shows a complete control valve 1 comprising an actuator 10, preferable a valve handle, in its first operating position, a first farther end position (a), relative the valve body 2 of the complete control valve 1, and this first operating position constitutes the shutting off position of the control valve.

[21] The actuator 10 is arranged at the valve neck 5 of the complete control valve 1, which is connected in an angle to the valve body 2 of the control valve. The valve neck 5 comprises a valve case 9 whereby a valve spindle 11 preferable is centric mounted. The complete valve case 9 also comprises a sleeve shaped and cylindrical inner cone 13 for control and presetting of the optional Kvs-value of the valve, which inner cone is stationary arranged with the valve spindle 11 and the inner cone has an open bottom for inflow of fluid and an opening 14 at its flank, for outflow of fluid. Moreover the complete valve case 9 comprises a sleeve shaped and cylindrical outer cone 15, which partly surrounds the upper part of the inner cone 13, and this outer cone, is provided, among other things, for shutting off the fluid flow through the complete control valve 1. The cylindrical outer cone 15 is displaceable arranged in the valve neck 5, and moreover the inner cone 13 and the outer cone 15 are displaceable relative each other. The complete control valve 1 also comprises an inlet connection 3 and an outlet connection 4 and also a flow through opening 7 located in the lower part of the valve neck in connection with a valve seat 6, and two connections for measuring nipples 8.
The fluid flows through the valve during operation from the inlet connection 3 via the inner cone 13, inwards through its bottom and further outwards through the opening 14 of the inner cone, thereafter further through the flow through opening 7 and then to the outlet connection 4.

In the first, farther end position (a) the top 10 of the actuator is connected to an adapter 18 which is stationary arranged to the complete valve case 9. The adapter 18 is provided to function as attachment for a mounted actuator, which is not shown. Since the top of the actuator 10 is connected to the adapter 18 a distinct farther end position is obtained for the axial motion of the actuator along the valve spindle 11. The actuator 10 is, independently of the position, always axially free moveable and rotatable relative the valve spindle 11.

In the first, farther end position (a), which constitutes the first operational position of the control valve the actuator 10 is in engagement, via teeth, arranged at the inside (not shown) of the actuator, with two counter gears 19, 21, provided with teeth, and which in turn are in engagement with a shut off screw 16 and a preset screw 17, respective. By a rotary motion of the actuator 10 in this first operating position the rotary motion is transmitted to the rotatable counter gear 19, provided with teeth, arranged for the shutting off function. This counter gear 19 in turn is in engagement with a rotatable and with teeth provided so called sun gear 22, which in turn is in engagement with the shut off screw 16. At the rotation of the actuator 10 the rotary motion is accordingly transmitted to the shut off screw 16, which by a threaded connection 23 converts the rotary motion to an axial motion of the preset screw 17. The preset screw 17 is stationary arranged with the outer cone 15 and consequently the outer cone 15 will also be moved axially and together with the inner cone 13. To completely close the valve 1 for flow through the outer cone 15 is moved axially in direction to the valve seat 6 until the whole of the flow through opening 7 is shielded by the outer cone 15. By that a shutting off function is obtained and this function is handled with the actuator 10 in its first operating position, the first, farther end position (a).

The first, farther end position (a) also includes the control position of the complete control valve 1. Exactly as is described above, the actuator 10 is free rotatable relative the valve spindle 11, resulting in that the control function of the valve isn’t influenced by the possible axial motion or rotation of the actuator and also not on the contrary, that the controlling influences the actuator 10 in this position. An affixed, not shown, actuator communicates with a sensor in the system where the complete control valve 1 is included, and the actuator, which is engaged with the valve spindle 11, moves the same axially in direction to or from the valve seat 6, depending on load and the need of an increased or decreased flow. The opening 14 of the inner cone 13 is hence shielded more or less by the valve seat 6, whereby the flow through the valve is changed. Ac-
cordingly, when the actuator 10 is in its first farther end position (a), two valve functions, controlling and shutting off, are included in the preferred embodiment. However, according to the invention, it is absolutely possible that other functions, totally different, are included in this position, depending on which type of valve the actuator is mounted.

[25] The invention also comprises a resilient member, preferable a reset spring 12 which is arranged to take the actuator 10 back to its first farther end position (a). The reset spring 12 has in its mounted position a clamped force directed mainly to the first farther end position (a) of the actuator 10 relative the valve body 2 and the force is indirectly transmitted to the actuator 10. By that the actuator 10 always returns to its first farther end position (a) and in this way it is secured that the function/functions, which are provided in this position, always are accessible, in any case except of those cases where an extern applied, opposite directed force, for instance hand power, acts on the actuator 10 by pressing the actuator inwards to the valve body 2. If the actuator 10 is pressed inwards to the valve body 2 the actuator takes its second end position (b).

[26] Figure 2 shows the actuator 10, preferable the valve handle, in its second operating position (b), closest to the valve body 2, and this second operation position constitutes the presetting position of the control valve.

[27] To move the actuator 10 to its second end position (b), that constitutes the second operating position, the actuator is pressed towards the valve body 2, for instance by hand power, whereby the bottom of the actuator 10 is connected to the cover 20, through which a second distinct functional position is set, a second end position (b), closest to the valve body 2.

[28] In the second end position (b), the actuator 10 is in engagement, by means of teeth, arranged at the inside of the actuator (not shown), with a counter gear 21 provided with teeth, which in turn is in engagement with the preset screw 17. At the presetting the outer cone 15 is in its upper, relative the valve seat, farther position. The presetting implies that the position/distance of the opening 14 of the inner cone relative the valve seat 6 is set. By a rotary motion of the actuator 10 in this second end position (b), the rotary motion is transmitted via the counter gear 21, which in turn is in engagement with the presetting screw 17 and, accordingly, the rotary motion of the actuator is transmitted to the presetting screw 17. This is rotatable but is not moved axially in the valve body 5 during the presetting. The lower part of the presetting screw 17 comprises an inner thread which cooperates with an outer thread provided at the upper part of the inner cone 13, and those threads consequently constitutes a threaded connection 25, and by rotating the presetting screw 17, via the intermediate threaded connection 25, the rotation is converted to an axial motion of the inner cone 13. By that the inner cone is moved axially in direction to or from the valve seat 6. Notice, that the outer cone 15
isn’t influenced, it stays in its upper position by the presetting. Later, when the presetting is performed and the valve is ready for controlling, the mutual position, given by the presetting, will not be changed between the inner and outer cone. The inner cone 13 comprises the opening 14 for flow through of fluid, which opening determine the control characteristic of the complete control valve 1, and by that the opening 14 of the inner cone is shielded more or less by the valve seat 6 the maximal flow of the control valve, its Kvs-value is set in this functional position, the second end position (b). Accordingly, the complete control valve 1 comprises a function for presetting of the Kvs-value and this function is accessible by that the actuator 10 occupies its second operating position, its second end position (b), closest to the valve body 2. However, according to the invention, it is absolutely possible that other functions, totally different, are included in this position, depending on which type of valve the actuator is mounted.

[29] COMPONENT LIST

1 control valve
2 valve body
3 inlet connection
4 outlet connection
5 valve neck
6 valve seat
7 flow through opening
8 connection for the measuring nipple
9 valve case
10 actuator
11 valve spindle
12 reset spring
13 inner cone
14 opening of the inner cone
15 outer cone
16 shut off screw
17 presetting screw
18 adapter
19 counter gear, shutting off
20 cover
21 counter gear, presetting
22 sun gear, shutting off
23 threaded connection
24 sun gear, presetting
25 threaded connection
Claims

[Claim 1] Device for flow control of a medium in a heating and cooling system where the device is a complete control valve (1), with a valve body (2) which comprises an inlet connection (3), an outlet connection (4), a valve neck (5) in which a valve seat (6) and a flow through opening (7) are arranged and at least one connection for the measuring nipple (8) for measuring of pressure and/or temperature levels, whereby, in the valve neck (5), a valve case (9) is provided in which a valve spindle (11) is arranged, and the valve case (9) comprises a first throttling device in the shape of an inner cone (13) and a second throttling device in the shape of an outer cone (15), characterized in that the outer cone (15) is sleeve shaped and cylindrical and partly surrounds the upper part of the inner cone (13), and the control valve (1) comprises an actuator (10) which is arranged to move both the inner cone (13) and the outer cone (15) axially in direction to respective from the valve seat (6) by a rotary motion of the actuator (10) in different operating positions, where the actuator (10) by means of teeth is arranged to, depending on operating position, be in engagement with either a first counter gear (19) provided with teeth, or a second counter gear (21) provided with teeth, which respective counter gears (19, 21) are arranged to transmit the rotary motion to sun gears (22, 24) provided with teeth and coordinated with respective counter gear (19, 21), whereby the sun gears (22, 24) in addition transmits the rotation to the shut off screw (16) and the preset screw (17), respective, which are coordinated with respective sun gear (22, 24), and where the rotation of the shut off screw (16) is converted to an axial motion at the preset screw (17) by means of a first thread connection (23) provided between the shut off screw (16) and the preset screw (17), and by that the preset screw (17) is stationary arranged with the outer cone (15) the outer cone (15) is moved axially in direction to or from the valve seat (6), and the rotation of the preset screw (17) is converted to an axial motion at the inner cone (13), in direction to or from the valve seat (6), via a second thread connection (25) provided between the preset screw (17) and the inner cone (13).

[Claim 2] Device according to claim 1, characterized in that the actuator (10), in a first operating position, which is the shut off position of the control valve (1), is arranged to move both the inner cone (13) and the outer
cone (15) axially towards the valve seat (6), by that the actuator (10) in this first operating position is engaged with the first counter gear (19), and accordingly, a rotary motion of the actuator (10) in the first operating position is converted to an axial motion at the preset screw (17), and accordingly also at the outer cone (15), and in addition also a simultaneous axial motion at the inner cone (13) by the axial motion of the motion the preset screw (17), while the preset screw (17) by means of the second threaded connection (25) is stationary arranged with the inner cone by the axial motion, and the fluid flow through the control valve (1) is discontinued when the flow through opening (7) is totally shielded by the outer cone (15).

[Claim 3] Device according to any of the claims 1-2, characterized in that the actuator (10), in a second operating position, which is the preset position of the control valve (1), is arranged to move the inner cone (13) axially in direction to or from the valve seat (6), by that the actuator (10) in this second operating position will be engaged with the second counter gear (21), and a rotary motion of the actuator (10) in the second operating position is converted to an axial motion of the inner cone (13), to obtain the preset of the control valve (1).

[Claim 4] Device according to any of the claims 1-3, characterized in that the actuator (10) is axially displaceable relative the valve spindle (11) between at least two positions, in which respective positions functions of the complete control valve are changed/performed.

[Claim 5] Device according to any of the claims 1-4, characterized in that the actuator (10) is rotatable in every position along its rotation axis.

[Claim 6] Device according to any of the claims 1-5, characterized in that the operating positions of the actuator (10) are two in number, a first farther end position (a), relative the valve body (2), and a second end position (b), closest to the valve body.

[Claim 7] Device according to any of the claims 2-6, characterized in that the complete control valve (1) comprises a resilient member, preferable a clamped reset spring (12), the spring force of which provides for that the actuator (10) always returns to its first farther end position (a) when an extern applied axial force expire.

[Claim 8] Device according to any of the claims 2-7, characterized in that the actuator (10) is displaceable to the second end position (b) by means of an axial force towards the valve body, preferable by hand.

[Claim 9] Device according to any of the claims 2-8, characterized in that the
first farther end position (a) comprises the normal position or the control position of the complete control valve (1).

[Claim 10] Device according to any of the claims 3-9, characterized in that the second end position (b) comprises the preset position of the complete control valve (1), in which position the maximal flow through the valve, its Kvs-value, is determined.

[Claim 11] Device according to any of the claims 2-10, characterized in that the first farther end position (a) comprises the shut off position of the complete control valve (1).

[Claim 12] Device according to any of the claims 1-11, characterized in that the actuator (10) is a valve handle.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F16K, F24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>A</td>
<td>WO 03044402 A1 (TOUR &amp; ANDERSSON AB), 30 May 2003 (2003-05-30); abstract; figure 1</td>
<td>1-12</td>
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<td>A</td>
<td>US 20090199905 A1 (TRANTHAM JOHN M), 13 August 2009 (2009-08-13); figures 1A,1B; claim 11</td>
<td>1-12</td>
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<td>A</td>
<td>US 20110042603 A1 (LOEFFLER GERHARD ET AL), 24 February 2011 (2011-02-24); figure 2; claim 1</td>
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International Patent Classification (IPC)

F24D 19/10 (2006.01)
F16K 1/52 (2006.01)
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