

Title: Control valve

Description

The invention relates to a regulating valve, which is attachable in particular in a bore of a hydraulic door closer, executed with a female thread, which valve has a body, 5
adjoined by a regulating area, and a thread provided with an anti-rotation means, the thread, including the anti-rotation means, being screwed into the female thread of the bore.

10 DE 102 28 872 B4 discloses a regulating valve for a door closer, which consists of a body and a regulating area. For regulating the regulating valve, the body has a thread that is screwable into a bore of the door closer. In this case, the regulating area is executed in a bush-shape and connected 15
to the body via a ball-joint connection. In order to avoid an unwanted rotation of the regulating valve, in particular of the regulating area, an anti-rotation means is provided, which is formed as an extension or as a projection and disposed at the regulating area. This extension is 20
longitudinally conducted in a groove within the housing of the door closer.

It is the object of the present invention to provide a regulating valve of the species described in the introduction, which has a simple design, an unwanted

adjustment of the regulating valve during operation being excluded.

As the solution to this problem, a regulating valve is proposed having the features of claim 1. Preferred further
5 developments are explained in the dependent claims.

According to the invention, it is provided that the anti-rotation means present a raised area, which cooperates with the bore or the female thread of the door closer. Thereby a clamping effect is achieved, which avoids an
10 unintentional releasing or rotation of the regulating valve.

Another improvement is achieved in that the body has a groove at which the raised area is disposed. Thereby the raised area can be supported in the groove to avoid rotation and is stabilized when being screwed into the bore,
15 such as to avoid shearing off.

It is of particular advantage that the groove be disposed in the region of a surface. Thereby it is achieved that the raised area, which is deformed once screwed-in, is not apportioned about the circumference of the shank or the
20 thread, which, in an unfavourable case, could cause a reduced clamping effect.

Furthermore, it is an advantage that the body has a shank, at which the raised area is disposed and projects beyond the diameter of the shank. Thus a clamping effect can be

achieved at the circumferential surface of the bore of the door closer.

The raised area being disposed at the thread and projecting beyond the diameter of the thread is of considerable advantage. Thus a clamping effect is transferred to several thread flanks of the female thread of the door closer, which equals higher clamping forces. Thereby an increased surface pressure is achieved at the engaging thread parts.

It has proven to be practical to dispose the thread at the shank. Thereby the production of the thread can be realized in a simple manner.

Another improvement is provided in that the regulating area consists of a shank prolongation with an end, wherein the shank prolongation is connected to the raised area via an extension. Thus the regulating area can be produced in a single operation.

Another substantial advantage is that the body has a pocket hole bore, which is disposed along the longitudinal axis of the body, opposite the head area. Thereby the regulating area can be produced as one piece and non-positively and positively connected, as well as aligned to the body.

It is furthermore advantageous that the pocket hole bore has an angular or non-circular cross-section. This provides

an additional protection against rotation when screwing the regulating valve into the bore of the door closer.

It is again advantageous that the extension is positively and rotation-resistantly fastened in the pocket hole bore. The
5 regulating area is thus connected to the body in a stabilized way.

Furthermore, it has proven to be advantageous that the extension has a neck which projects into a bore of the body. Thereby the extension is additionally secured against
10 rotation.

It is a substantial advantage that the raised area has a circumferential collar corresponding to lateral surfaces of the groove. Therewith the raised area bears against the lateral surfaces and counteracts a notch effect when being
15 screwed into the door closer, respectively when the mechanic adjusts the regulating valve within the door closer.

It is an advantage that the raised area is positively and/or non-positively and/or positively through material disposed
20 at the thread. This allows for a very fine adjustment of the clamping effect of the material used at the raised area, because it engages directly into the corresponding thread of the door closer and is guided in the thread flanks through the material flow of the raised area. The material flow of the
25 raised area is achieved in that screw pitches are formed at

the raised area, when screwing the regulating valve into the bore of the door closer and thus into the corresponding thread at that location. This generates a high surface pressure, in particular between the thread flanks of the female thread and of the regulating valve. It has been shown that, due to such a disposition, the engaging thread parts do no longer rotate on their own. Furthermore, a manual and/or intentional adjusting of the regulating valve is obviously still possible. In other words, at any time the regulating valve can be adjusted corresponding to the specific requirements of a defined closing behaviour, the anti-rotation means effectively avoiding automatic rotation, in particular the one caused by occurring dynamic stresses.

The regulating area has an end facing away from the body and being formed tapered, preferably cone-shaped. This embodiment offers a more precise adjustment of the oil flow, which considerably influences the closing speed of the closing operation. Despite the forces, which are originated by the fluid flow, acting upon the regulating valve, the raised area ensures that the regulating valve does not readjust accidentally and independently.

It has proven to be advantageous that the raised area is attached at the body through injection moulding. Thereby the regulating area is produced in a simple mode of operation. Depending on the requirements with regard to the material to be processed, the injection moulding

procedure can be modified. The body may be made from metal, for example zinc, brass or steel, the regulating area being preferably made from plastic material. In particular in order to achieve a high strength, the said plastic material
5 may be fibre-glass reinforced, in particular, the plastic material may have a certain percentage of fibre glass and/or carbon fibre and/or aramid fibres.

Another possibility is that the body and/or the regulating area consist of plastic material, in particular the body
10 consisting of a fibre reinforced plastic material. Thereby the overall regulating valve can be manufactured in a single operation.

Another advantage turns out to be a coloured execution of the body. Thereby, different types of regulating valves can
15 be visually distinguished.

It is advantageous that the door closer has a supply channel, a drainage channel and a cone-shaped valve seat, a fluid being able to be conducted through the supply channel along the valve seat and to the drainage channel.
20 The free end of the regulating area is substantially adapted to the valve seat of the door closer. As a rule, there is a certain distance between the valve seat and the preferably cone-shaped end of the regulating area, such that the fluid of the supply channel can flow between the valve seat and
25 the preferably cone-shaped end of the regulating area into the direction of the drainage channel.

Another advantage is that the raised area has a radius, which, while screwing the regulating valve into the female thread of the bore of the door closer, offers a minor initial screwing torque. The developing screw pitches at the raised area can thus be formed in a simple and easy way. Furthermore, no important notch effects are generated at the raised area.

Figures 6 and 7, as well as parts of the Figures 8 and 9 show the regulating area of the inventive regulating valve, respectively the way the regulating area looks like after the injection process and how it is directly connected to the body. In order to be able to clearly describe the regulating area in detail, these illustrations (Figure 6 and 7) have been chosen, in which the regulating area is illustrated as an individual part. In this shape, the regulating area of the inventive regulating valve will not be present as an individual part; but it will be directly connected to the body after the injection moulding.

The drawings show:

Figure 1: an inventive regulating valve in a perspective view,

Figure 2: the inventive regulating valve of Figure 1 in a full section along the sectional plane Y-Y,

Figure 3: a body of the inventive regulating valve in a perspective view,

Figure 4: the body of the inventive regulating valve of Figure 3 in a full section along the sectional plane Z-Z,

5 Figure 5: the body of the inventive regulating valve in a top view,

Figure 6: the regulating area of the inventive regulating valve in a perspective view,

10 Figure 7: the regulating area of the inventive regulating valve of Figure 6 in a full section along the sectional plane X-X,

Figure 8: a detail of a slider in a full section,

Figure 9: a detail of the slider of Figure 8 in a perspective illustration,

15 Figure 10: a door closer, the regulating valve being screwed-in.

Figure 1 shows a regulating valve 1, which is provided for a hydraulic door closer. In this case, various door closers can be considered, which for example can be operated by an eccentric cam disc according to DE 103 61 085 A1 or by a
20 toothed rack according to DE 199 01 234 C1. The regulating valve 1 has a head area 5, at which a hexagon 5a as well as a slot 5b are formed. The shank 16 of the regulating valve 1 has a thread 6, at which a surface 21 is located. There is a raised area 7 in partial areas of the

surface 21. One end 4 of the regulating valve 1 is formed in a tapering cone-shape. Furthermore, Figure 1 has a sectional plane Y-Y.

Figure 2 shows a full section of the regulating valve 1 along the sectional plane Y-Y of Figure 1. The regulating valve 1 consists of a body 2, as well as of a regulating area 3. Substantially, the regulating area 3 consists of a shank prolongation 16a and a free end 4. A raised area 7 is presented with a radius 18, which ensures that, when screwing the regulating valve 1 into the bore of the door closer, a smooth initial cut takes place at the raised area 7. The body 2 has a reception 17 for a sealing element. This sealing element may consist for example of an O-ring. Furthermore, the body 2 has a thread 6 at the shank 16. A neck 46 is arranged at the opposite side of the raised area 7.

Figure 3 shows the body 2 having a shank 16 at which a thread 6 is arranged. This thread 6 has a surface 21 extending along the overall thread 6. A groove 19, which also may extend along the total length of the thread, is recessed into the surface 21.

The lateral surfaces 32a and 32c are produced through the recess of the groove 19. At the side of the body 2 opposite the head area 5, the body 2 has a pocket hole bore 30, which cooperates positively with the shank prolongation 16a. The pocket hole bore 30 may have, for example a

rectangular, square or triangular cross-section. The bottom of the groove 19 has a material exit opening 20, extending all the way into the positive pocket hole bore 30. Furthermore, on the opposite side of the surface 21, a bore 44, which extends all the way into the pocket hole bore 30, is arranged at the shank 16 as an additional anti-rotation means. Furthermore, Figure 3 has a sectional plane Z-Z.

Figure 4 shows the body 2 in a full section. In this case, it is shown that the surface 21 as well as the groove 19 are preferably disposed parallel to the axis of rotation 35. The lateral walls 32b and 32d are produced through the recess of the groove 19. Furthermore, there are the pocket hole bore 30, as well as the adjoining material exit opening 20 and the bore 44 for the anti-rotation means.

Figure 5 shows the body 2 wherein a thread 6 is provided at its shank 16. The groove 19 is located in the partial area of the surface 21, whereby the locating surfaces 32a, 32b, 32c and 32d are produced. Furthermore, there is the material exit opening 20 in the region of the groove 19. The surface 21 is formed centrally with regard to the axis of rotation 35. A reception 17 for a sealing element is located between the head area 5 and the thread 6. During the injection moulding, the plastic material reaches the groove 19 through the material exit opening 20 and its raised form is controlled. The lateral areas 32a and 32b of the groove 19 serve as an additional stabilization of the raised area 7

to prevent rotation when the mechanic screws the regulating valve 1 into a bore of the door closer 11, respectively when he adjusts the closing behaviour of the door closer 11 correspondingly (Figure 10).

- 5 Figure 6 shows the regulating area 3 in a perspective view. The raised area 7 has a collar 7a which is disposed circumferentially at the raised area 7. This circumferential collar 7a corresponds to the lateral surfaces 32a, 32b, 32c and 32d of the groove 19 and thus represents an additional
10 protection against rotation. The neck 46 is arranged on the opposite side of the raised area 7. The end 4 of the regulating area 3 is disposed at the shank prolongation 16a in a tapering cone shape.

- Figure 7 shows the regulating area 3 in a full section in
15 which the radius 18 as well as the raised area 7 are visible. The neck 46, the shank 16a and the extension 16b are arranged at the regulating area 3.

- Figure 8 shows the shaping of the raised area 7 during the production process. In this case, a slider 8, which is a part
20 of an operating means, is employed during the injection moulding. The slider 8 has a female mould 9, which is filled with material during the injection moulding. The female mould 9 is limited at the supporting surface 10. The raised area 7 is thus shaped. A portion of the regulating area 3
25 with the raised area 7 and the neck 46 is illustrated, in order to clearly show that the raised area 7 is formed

during the injection moulding with the assistance of the slider 8 and of the female mould 9 indicated at that location. The collar 7a is formed through the groove 19 of the body 2. For example polyacetal (POM) may be used as material.

Figure 9 shows a section of the slider 8, which forms the shape of the raised area 7 at the regulating area 3 through the female mould 9 at the slider. The female mould 9 ends at the supporting surface 10 and is limited at that location.

The slider 8 is a part of the operation means, used to perform the injection moulding. The slider 8 rests with its supporting surface 10 on the surface 21 of the body 2 (Figure 3) and thus serves as a seal during the injection moulding such that no plastic material is able to flow out of the mould in an uncontrolled manner.

Figure 10 shows a door closer 11 into which a regulating valve 1 is screwed. The regulating valve 1 has a sealing element 12. The end 4 of the regulating area 3 and thus of the regulating valve 1 is located in a cone-shaped valve seat 15 of the door closer 11. A supply channel 13, through which oil is supplied, is located in the region of the cone-shaped end 4 of the regulating area 3. Generally the cone-shaped end 4 of the regulating area 3 does not directly bear against the valve seat 15, such that the oil can flow through the small channel, formed between the valve seat 15 and the cone-shaped free end 4 of the regulating area 3,

into the direction of a drainage channel 14. The flow cross-section for the oil can be adjusted at the regulating valve 1, whereby in particular the closing behaviour of the door closer 11 is controllable. On account of the above
5 described anti-rotation means, the forces produced by the flowing oil and acting upon the regulating valve 1, are unable to cause an unwanted rotation of the regulating valve 1, not even in the tolerance range.

The above described regulating valve 1 is produced as
10 follows. The body 2 is manufactured in advance in the shape according to Figure 3 and has, at its shank 16, preferably at the thread, a surface 21 into which a groove 19 is machined, which preferably has a material exit opening 20. The body 2 is inserted into operating means,
15 preferably a moulding tool. For clarity's sake, the illustration of the operating means has been omitted. Among other means, the operating means include at least one slider 8, which represents the shape of the raised area 7. The slider 8 sits with its surface 10 on the surface 21 of the inserted
20 body 2 and thus seals the surface 21 to the exterior. In the interior, a hollow space is created through the groove 19, the female mould 9, the material exit opening 20, the bore for the anti-rotation means 44, as well as through the positive pocket hole bore 30. While the operating means
25 are brought into the processing position, another area of the hollow space is created which forms the shank 16 of the regulating area 3 and the free end 4 of the regulating

area 3. Thus the complete hollow space of the operating means in conjunction with the body 2 corresponds to the form illustrated in Figures 6 and 7.

During the injection moulding, a plastic material, which in the present exemplary embodiment is a polyacetal (POM), distinguished among others things by its excellent sliding characteristics, good resistance to chemicals, and high abrasion resistance, is injected into the above described hollow space. Thereby the form illustrated in Figures 6 and 7 is created. This form, such as illustrated in Figures 6 and 7, is non-positively and/or positively connected to the body 2. Subsequently to the injection moulding, the operating means is opened, the slider 8 is removed from the surface 21 of the body 2, such that the regulating valve 1 according to Figure 1 is provided in the present operating means and is ready to be removed therefrom.

When screwing the regulating valve 1 into the bore 40 of the door closer 11, the radius 18 at the raised area 7 assists in an easy initial screwing and a subsequent screwing into the female thread of the door closer 11. Furthermore, an additional clamping effect is achieved through the inventive anti-rotation means, because the axial clearance between the thread 6 of the regulating valve 1 and the female thread 41 of the door closer 11 is filled by the raised area 7. Thereby a high surface pressure is achieved at the thread portions engaging each other, in

particular at the thread flanks free from the anti-rotation means. At the same time, the regulating valve 1 can be manually adjusted and/or unscrewed from the bore at any time.

List of reference numerals

	1	regulating valve
	2	body
5	3	regulating area
	4	end
	5	head area
	5a	hexagon
	5b	slot
10	6	thread
	7	raised area
	7a	collar
	8	slider (part of the operating means)
	9	female mould
15	10	supporting surface
	11	door closer
	12	sealing element
	13	supply channel
	14	drainage channel
20	15	valve seat
	16	shank
	16a	shank prolongation
	16b	extension
	17	reception
25	18	radius
	19	groove

	20	material exit opening
	21	surface
	30	pocket hole bore
	32 a	lateral surface of the groove
5	32 b	lateral surface of the groove
	32 c	lateral surface of the groove
	32 d	lateral surface of the groove
	35	axis of rotation
	40	bore
10	41	female thread
	44	bore
	46	neck
	X-X	sectional plane
15	Y-Y	sectional plane
	Z-Z	sectional plane

Patent claims

1. A regulating valve (1), which is attachable, in particular in a bore (40) of a hydraulic door closer (11), executed with a female thread (41), which
5 valve has a body (2), adjoined by a regulating area (3), and a thread (6) provided with an anti-rotation means, the thread (6) including the anti-rotation means being screwed into the female thread (41) of the bore (40), characterized in that
10 the anti-rotation means present a raised area (7), which cooperates with the bore (40) or the female thread (41) of the door closer (11).
2. A regulating valve (1) according to claim 1, characterized in that the body (2) presents a
15 groove (19) at which the raised area (7) is disposed.
3. A regulating valve (1) according to claim 2, characterized in that the groove (19) is disposed in the area of a surface (21).
- 20 4. A regulating valve (1) according to claim 1, characterized in that the body (2) presents a shank (16), at which the raised area (7) is disposed and projects beyond the diameter of the shank (16).

5. A regulating valve (1) according to claim 1, characterized in that the raised area (7) is disposed at the thread (6) and projects beyond the diameter of the thread (6).
- 5 6. A regulating valve (1) according to claim 4, characterized in that the thread (6) is disposed at the shank (16).
7. A regulating valve (1) according to claim 1, characterized in that the regulating area (3)
10 consists of a shank prolongation (16a) with an end (4), the shank prolongation (16a) being connected to the raised area (7) via an extension (16b).
8. A regulating valve (1) according to claim 1, characterized in that the body (2) presents a
15 pocket hole bore (30) which is disposed along the longitudinal axis of the body (2) opposite the head area (5).
9. A regulating valve (1) according to claim 8, characterized in that the pocket hole bore (30)
20 presents an angular or a non-circular cross-section.
10. A regulating valve (1) according to claim 7 to 9, characterized in that the extension (16b) is positively and rotation-resistantly attached within
25 the pocket hole bore (30).

11. A regulating valve (1) according to claim 10, characterized in that the extension (16b) has a neck (46) which projects into a bore (44) of the body (2).
- 5 12. A regulating valve (1) according to claim 2, characterized in that the raised area (7) presents a circumferential collar (7a) which corresponds to the lateral surfaces (32a to 32d) of the groove (19).
- 10 13. A regulating valve (1) according to claim 5, characterized in that the raised area (7) is disposed positively and/or non-positively and/or positively through material at the thread (6).
14. A regulating valve (1) according to claim 7,
15 characterized in that the regulating area (3) has an end (4) which is facing away from the body (2) and is formed tapered, preferably cone-shaped.
15. A regulating valve (1) according to one of the
20 preceding claims, characterized in that the regulating area (3) is attached to the body (2) through injection moulding.
16. A regulating valve (1) according to one of the preceding claims, characterized in that the body (2) and/or the regulating area (3) consist of plastic

material, and that in particular the body (2) consists of a fibre reinforced plastic material.

5 17. A regulating valve (1) according to one of the preceding claims, characterized in that the execution of the body (2) is coloured.

10 18. A regulating valve (1) according to one of the preceding claims, characterized in that the door closer (11) presents a supply channel (13), a drainage channel (14) and a cone-shaped valve seat (15), wherein a fluid can be conducted through the supply channel (13) along the valve seat (15) to the drainage channel (14).

15 19. A regulating valve (1) according to claim 1, characterized in that the raised area (7) presents a radius (18) which, when the regulating valve (1) is screwed into the female thread (41) of the bore (40) of the door closer (11), offers an easy initial screwing torque for the mechanic.