

VALVE OF A HYDRAULIC DOOR ACTUATING DEVICE

Description

The invention relates to a valve of a hydraulic door actuating device, i.e. of a hydraulic door closer, respectively of a swing leaf operator according to the generic part of claim 1.

From the document DE 10 2005 030 696 A1 for example, a hydraulic door operator is known, in which a magnetic valve is utilized to allow for closing the door in case of fire. However, this would require to provide sensing technology for detecting the door opening angle, as well as trigger electronics for activating the magnetic valve, which systems are expensive and result in a relatively complex structure.

Furthermore, in such door actuating devices, it is partly required to lock a door in a position. In particular in a double leaf swing door system, the active leaf needs to be locked in position or prevented from closing, as long as the inactive leaf is still so wide open, that, when closing the active leaf, the closing sequence, - inactive leaf prior to active leaf – can not be respected.

An arresting device, which is electrically switched, is known from the document DE 100 23 760 A1. In this case, a

sensing control is utilized, in order to correctly activate the arresting device. This results again in a relatively complex structure. In addition, the safety of operation of the arresting device is affected if the power supply for the arresting device fails.

It is the object of the present invention to at least reduce the shortfalls of the state-of-the-art.

This problem is solved by the features of the claims 1 and 15.

According to the invention, a valve is provided in the hydraulic circuit of a door actuating device, in particular of a door closer or a swing leaf operator, in particular for blocking and/or damping a door movement. Such a door actuating device is namely adapted to open and/or to close a connected door. The door actuating device has a housing. The valve is adapted to be utilized in the door actuating device in order to influence the flow of hydraulic fluid of the door actuating device, therefore it will be able to block or to release the flow.

The inventive valve comprises in particular a bushing and a slide. The slide is guided in the bushing to be longitudinally displaceable and is pre-tensioned along the longitudinal displaceability path by means of a return spring. The slide has a stop face for hydraulic fluid configured in such a way

that the hydraulic fluid can be urged against said stop face. This stop face is a portion of the slide, respectively of the valve body, which, by means of the return spring, is pushed against a counter edge, which is configured in the bushing of the valve. This means, on account of the action of the return spring, the stop face bears against the counter edge in a fluid-sealing manner and thus blocks the flow of hydraulic fluid. According to the invention, the slide is configured to be mechanically charged from the outside against the action of the return spring. This means for example, when closing a connected door, the slide can be pushed in the direction of the return spring by a working piston of the door actuating device, such that the stop face is lifted off the counter edge and therefore the blockage of the flow of hydraulic fluid is at least partially neutralized. This means, the slide is configured to be mechanically charged from the outside against the action of the return spring and away from the counter edge. On account of the spring-loaded support of the slide, with ceasing mechanical charge, the slide is automatically pushed back by the return spring in the direction of the counter-edge, such that the stop face of the slide eventually can reach again the contact position against the counter-edge in a fluid-sealing manner, if the mechanical charge is lower than the force of the return spring or is inexistent.

Inserting the valve into the housing of the door actuating device allows for installing the valve in the already

assembled door actuating device and, if required, to remove it, and therefore to exchange it for example.

Preferably both the valve body and the return spring are accommodated in the bushing.

Advantageous further developments of the invention are the subject matter of the dependent claims.

Preferably the slide is configured to protrude from the bushing with one end facing away from the return spring. This is advantageous in that the movement path of the working piston in the direction of the return spring may be delimited for example by the bushing. This means, the slide can only be moved in the direction of the return spring until, on the outside, it is flush with the bushing. In this case, mechanical actuating means are possible, such as the aforementioned working piston, the exterior dimensions thereof exceeding the ones of the slide. This is in particular the case with working pistons in hydraulic door actuating devices, which are moved in the respective housings thereof in a fluid-sealing manner along the interior walling. As a result, additional safety precautions, in order to limit the movement path, are not required.

In particular a distance between the slide and the bushing, through which the hydraulic fluid needs to flow, may be dimensioned such that, with the counter-edge being lifted

off, the flow of hydraulic fluid is still impeded. A damped opening and/or damped closing of the connected door is thereby made possible in a very simple way.

Preferably the stop face is disposed inclined at an angle with regard to the longitudinal displaceability path of the slide. Thereby a sort of a tapered ramp is created for the hydraulic fluid. This results in the advantage that the counter-edge and the tapered ramp punctually always abut against each other along a straight line or a curve, which, compared to a flat abutment, results in a sealing action which is better, respectively easier to achieve. Preferably the angle in the direction of the slide, respectively the valve body, is acute and advantageously is about 60° .

At a side facing the bushing, the slide preferably has a recess, which is delimited by the stop face at one side, extends along the longitudinal displaceability path of the slide, encloses a preferably hollow cylindrically-shaped hollow space with the bushing, and is hydraulically connected to the hydraulic connection of the bushing. The recess has the advantage that the slide can move along the longitudinal extension of the bushing, without interrupting the fluid exchange between the slide and the bushing.

In addition or as an alternative, the valve comprises furthermore an attachment block, into which the bushing is

inserted and which is configured to be stationarily inserted into the hydraulic door actuating device. Thus, the attachment block serves for fastening the inventive valve in the door actuating device. This means, with regard to the housing of the door actuating device, the attachment block represents the stationarily disposed part of the valve.

At a side facing the housing of the door actuating device, preferably the attachment block likewise has a recess, which extends along the direction of insertion respectively fastening of the attachment block in the housing of the door actuating device, encloses again a preferably hollow cylindrically shaped hollow space together with the housing of the door actuating device, and is hydraulically connected to both the hydraulic line of the attachment block and to a hydraulic line of the housing. The recess has the advantage of allowing to insert the attachment block into door actuating devices, in which the hydraulic lines to be connected to the valve are possibly located on a respective other side with regard to the valve and are nevertheless hydraulically connected to the recess of the attachment block. The application range of the valve is thereby enhanced and therefore it is more universally applicable.

Preferably the inventive valve includes furthermore an adjusting section, which is disposed to be longitudinally movable in the attachment block and is in engagement with the bushing in such a way that, if it moves longitudinally in

the attachment block, it entrains the bushing. Thereby the position of the bushing and of the slide can be adjusted within the attachment block to the respective door actuating device. The slide is actuated for example by a working piston of the door actuating device. Now if the working piston, with regard to the attachment block, is located further inside the door actuating device, the arrangement, consisting of slide and bushing, can be moved in the direction of the working piston, even though the attachment block does not change its position. In addition, the bushing, as described above, can delimit the movement path of the mechanical charge element of the door actuating device. By means of adjusting, respectively displacing the bushing in the attachment block, the displacement path of said charge element is thereby adjustable. The application range of the valve as well is thereby enhanced and it is therefore more universally applicable.

According to the invention, the adjusting section and the bushing can be integrally configured whereby the structure of the valve is simplified.

The adjusting section is disposed in the attachment block to be preferably freely rotatable. It is thereby possible, by rotating the adjusting section with regard to the attachment block, to move the adjusting section into the inside of the door actuating device or to move it in the opposite

direction, while using a screw driver for example, which simplifies the operability of the valve.

At a side facing the attachment block, the bushing preferably has again a recess, which extends along the longitudinal movability path of the adjusting section, encloses a hollow space together with the attachment block, and is hydraulically connected to both the hydraulic connection of the bushing and to the hydraulic line of the attachment block. The recess has the advantage that the bushing can be moved within the attachment block by means of the adjusting section, without interrupting the fluid flow between the bushing and the attachment block. This circumstance likewise serves the universal applicability of the inventive valve.

Preferably one of the above described recesses is configured to be circumferential. A hollow cylindrically shaped hollow space is thereby created between the respective recess and the directly adjacent part. This is advantageous in that the part with the recess can be rotated within the respective adjacent part without losing the respective hydraulic connection. This means, the hydraulic connection is maintained independently from the rotating position of the part with the recess, and is thereby always guaranteed, which increases the safety of operation.

Preferably the slide has furthermore a through-opening which is in hydraulic connection with an interspace between the slide and the bushing, and extends in the direction of an actuating element of the door actuating device or of a closing sequence controller. The through-opening directs the fluid stream between said interspace, in which the stop face may be located, and an exterior side of the valve. The exterior side is another location than the one where the attachment block is hydraulically connected to the housing of the door actuating device.

At an end facing away from the interspace, the slide has preferably one continuous recess or opening, which essentially extends transversely to the longitudinal displaceability path of the slide, and is configured continuous leading away from the through-opening. A fluid channel is thereby created, which guarantees the fluid exchange between the through-opening and the door actuating device, even if, by way of example, the working piston of the door actuating device is abutting against the slide, which increases the safety of operation. This opening is easy to realize by drilling a hole.

Preferably, at an end facing away from the interspace, the bushing as well has one continuous recess or opening, which essentially extends parallel to the longitudinal extension of the continuous recess or opening at the slide. A fluid channel is thereby created in the bushing as well, which guarantees the fluid exchange between the slide and

the door actuating device, even if, by way of example, the working piston of the door actuating device is abutting against the slide, which circumstance further increases the safety of operation.

An inventive door actuating device is adapted to hydraulically open and/or to close a connected door. The door actuating device has a housing, a hydraulic circuit through which hydraulic fluid is forced to move, when the door actuating device executes an opening movement respectively a closing movement, and has one of the above described valves. The valve is incorporated into the hydraulic circuit such that, on account of the action of the return spring, it blocks the flow of hydraulic fluid in the hydraulic circuit. The slide of the valve is mechanically charged in the direction of the return spring by an actuating device, for example a working piston of the door actuating device during the opening movement or closing movement thereof of the door, and is therefore urged or forced to move away from the counter-edge.

Further details, advantages and features of the present invention will become apparent from the following description of several embodiments, reference being made to the drawing, in which:

Figure 1 shows a diagrammatically simplified sectional illustration of half a valve according to a first

embodiment of the invention, in a first operating position,

Figure 2 shows an illustration of the valve corresponding to the one of Figure 1 in a second operating position and in a slightly modified form,

Figure 3 shows an illustration of the valve corresponding to the one of Figure 1 in a third operating position and again in a slightly modified form,

Figure 4 shows a valve according to a second embodiment of the invention in a section, and

Figure 5 shows a valve according to a third embodiment of the invention.

In the Figures 1 to 3, respectively a valve 1 according to a first embodiment of the invention is illustrated in a simplified manner, wherein, according to the illustration, only the upper half is selected and illustrated in the Figures, namely the half of the valve visible above a longitudinal axis L, in the following identified by valve 1.

Accordingly, the valve 1 has a bushing 2, in which a slide 3 is guided. In this case, the slide 3 is pre-tensioned by means of a return spring 4 in a direction parallel to the longitudinal axis L of the bushing 2, and is thereby pushed

against a counter-edge 6, which is configured inside and at the bushing 2.

For this purpose, the slide 3 has a stop face 5, which, according to the angle α indicated Figure 3, is disposed to be inclined with regard to the longitudinal axis L. On account of the action of the return spring 4, the stop face 5 of the slide 3 reaches abutment against the counter edge 6 in a fluid-sealing manner. This means, the blocking action of the valve 1 is created by the sealing contact between the stop face 5 and the counter edge 6.

The bushing 2 has furthermore a hydraulic connection 7, which, in the present example, is configured as a flow channel completely passing through the bushing 2. Via an exterior recess 8 in the bushing 2, via a line section 9 of an attachment block 10, and via another recess 11 now of the attachment block 10, the hydraulic connection 7 is in hydraulic communication with a hydraulic line 12, which leads to a hydraulic source, which is not illustrated in more detail in the Figures. The hydraulic channel 12 is preferably configured in a housing 13 of a door actuating device not illustrated in detail, namely a door closer or a swing leaf operator, because, in the installed condition, the valve 1 is incorporated into the hydraulic circuit of such door actuating devices.

The regular flow direction of a hydraulic fluid H of the door actuating device 1 in the valve 1 is illustrated by an arrow ÖF. The flow direction ÖF preferably corresponds to an opening direction of the door actuating device, respectively of the connected door, in which the valve 1 blocks the flow of fluid. This is for example practical to prevent the connected door in any case from exceeding a maximum opening angle. If the maximum angle would be exceeded, the door actuating device could be damaged or impact on a wall for example.

In Figures 1 to 3, the arrows H represent the flow direction of the hydraulic fluid H, which, while passing through the hydraulic connection 7, can be introduced, respectively is introduced into an exterior recess 14 of the slide 3 if, by way of example, the connected door or the door actuating device executes a closing movement. By introducing the hydraulic fluid H into the recess 14, the hydraulic fluid H is urged onto the stop face 5.

In the condition shown in Figure 2, in which, by way of example, the door is open, the flow of fluid through the hollow space between the slide 3 and the bushing 2 is relatively low or inexistent. This means, the usual closer spring of the door actuating device is able to initiate the closing procedure with all its force, which is advantageous for the required initial acceleration of the door.

With a progressive movement of the door and the thereto associated movement of an actuating device of the door actuating device, configured by way of example as a piston 24, away from the valve 1, the return spring 4 moves the stop face 5 of the slide 3 closer and closer in the direction of the counter-edge 6. As can be particularly well seen in Figure 3, the hollow space between the slide 3 and the bushing 2 is relatively narrow in the area of the counter-edge 6. This narrowness impedes the flow of fluid and thus causes a relatively slow speed of the door. The closing speed is for example thus impeded at the end of the closing movement, which results in damped closing.

Obviously the valve 1 can be likewise inserted in that the piston 24 urges the stop face 5 away from the counter-edge 6, when the door is being opened. In this case, a damped opening is achieved at the end of the door opening movement.

As in particular illustrated in Figure 2, the valve 1 has preferably a screw section 15, for example in the shape of a hexagon socket screw head. At an exterior circumference, the screw section 15, at least in some sections, has preferably an exterior thread section 15a, by means of which it is screwed into a female thread section 10a configured in the attachment block 10. So as not to have hydraulic fluid penetrate to the outside through this screw connection, preferably the screw section 15 may

have a surrounding groove 15b on the exterior circumference, into which a seal 16 is inserted, by way of example in the shape of an O-ring. As a consequence, the seal 16 is inserted between the attachment block 10 and the screw section 15 in a fluid-sealing manner, as advantageously the seal is configured to be elastic and is squeezed between the groove 15b and the opposite interior surface of the attachment block 10.

Rotating the screw section 15 results in a translational movement of the screw section 15 within the attachment block 10, along the longitudinal axis L.

Via a key-and-slot joint, for example the bushing 2 is preferably accommodated in the housing 13 of the door actuating device with an anti-rotation protection. As can be seen by way of example in Figure 2, the housing 13 has a projection 13b for this purpose, which extends along the longitudinal axis L and protrudes in the direction of the bushing 2. The bushing 2 in turn has a groove-shaped guide in the shape of a track or of a guiding recess 2d. The guiding recess 2d can therefore only move along the projection 13b and thereby the bushing 2 can only move translationally in the attachment block 10, according to Figure 2 to the right and to the left. Another advantage of this linear guidance for the bushing 2 consists in that the hydraulic line 9 and the hydraulic connection 7 are able to change their positions with regard to each other only along

one straight line, by way of example parallel to the longitudinal axis L, which increases the safety of operation.

As shown in Figure 3, the linear guidance of the bushing 2 may also be realized by the attachment block 10. For this purpose, compared to Figure 1 and 2, the attachment block 10 is configured to be longer, and, by way of example, has a guiding recess 10d, in which the bushing 2 is guided to be longitudinally movable along the longitudinal axis L by means of a configured guiding projection 2h.

A reception space is configured for the return spring 4 at a section of the bushing 2 and of the slide 3 distant from the screw section 15. For this purpose, both the bushing 2 on its inside and the slide 3 on its outside have recesses 2a or 3a which are respectively configured to be surrounding. A hollow cylindrically shaped hollow space is thereby created between the bushing 2 and the slide 3. As an alternative, the recess 3a is foregone, and the recess 2a creates this hollow space by itself or vice versa. The return spring 4 is inserted into this hollow space and, with its end facing the screw section 15, is bearing against an abutment surface 2b of the bushing 2. This means, by way of example, the return spring 4 is configured as a helical spring. The abutment surface 2b is advantageously configured by means of a wall of the bushing 2 delimiting the recess 2a. With its end, facing away from the screw section 15, the return spring 4 is bearing against a spring abutment 17. In

the example shown in Figure 1, the spring abutment 17 is configured by means of a ring, which is inserted into a circumferentially surrounding groove 3b of the slide 3. The ring has preferably a rectangularly-shaped cross-section such as to offer a good abutment surface for the return spring 4. The groove 3b prevents the ring from moving to the right or to the left in Figure 1 and 2.

As an alternative, the spring abutment 17 is only supported in the direction of the return spring 4, such as illustrated in Figure 2, as the return spring 4 is pre-tensioned, it prevents the spring abutment 17 from moving in the direction of the return spring 4. In the example shown, the spring abutment 17 is placed onto the recess 3a, onto which the return spring 4 as well is placed, such that therefore no additional reception is required for the spring abutment 17.

As an alternative, at the end facing away from the screw section 15, the slide 3, as shown in Figure 3, has a male thread section 3f, to which the spring abutment 17 in the shape of a nut or of a ring with female thread is screwed. It is thereby possible to adjust the pre-tension and therefore the return action of the return spring 4. Advantageously, in cross-section, the ring has a non-round outer contour, for example in the shape of an exterior hexagon, such that the ring can be rotated for example by means of an open-end wrench and thereby moved translationally in the direction

of the abutment surface 2b or away from it, and the pre-tension of the return spring 4 can thereby be adjusted.

In order to reduce leakage losses in the direction of the return spring 4 to the greatest possible extent, the slide 3 has preferably furthermore a circumferentially surrounding groove 3c, into which a seal 18 is inserted analogously to the seal 16, and is thereby disposed in a fluid-sealing manner between the bushing 2 and the slide 3.

Furthermore, also at a side of the hydraulic line 9, which is opposite with regard to the screw section 15, the bushing 2 has preferably a circumferentially surrounding groove 2c, analogously to the grooves 3c, 15c, into which a seal 19, analogously to the seals 16, 18, is inserted and therefore disposed in a fluid-sealing manner between the attachment block 10 and the bushing 2.

In order to keep the leakage losses between the housing 13 of the door actuating device and valve 1 as low as possible, seals 20, 21 are provided preferably on both sides of the hydraulic channel 12, which are disposed in a preferably clamped manner between the housing 13 and the attachment block 10. For this purpose, preferably the attachment block 10 has circumferentially surrounding grooves respectively recesses 10b, 10c at appropriate locations. However, at opposite locations corresponding with the grooves 10b, 10c, the housing 13 as well may

have recesses or grooves 13a, which in this case are inside and surrounding.

Preferably, in an area on the right and/or left side of the hydraulic line 9, the attachment block 10 has an exterior diameter, which is smaller than an interior diameter of the housing 13 in the associated area, whereby the recess 11 is created. Thereby, a hollow cylindrically shaped hollow space is created by way of example between the attachment block 10 and the housing 13. On account of this hollow space, the hydraulic line 9 does not have to be aligned with the hydraulic line 12, in order to allow for the flow of fluid. The hydraulic lines 9, 12 may be rather disposed offset with regard to each other. It is thereby possible to standardize the valves 1, which can be employed in differently configured door actuating devices which in turn helps reduce manufacturing costs.

For the screw section 15 to be able to move and push the bushing 2 not only in the direction of the door actuating device, but also to be able to move the bushing 2 in the opposite direction, at the side facing the bushing 2, the screw section has a catch device.

In the example shown in Figure 1, the catch device is configured by means of a preferably ring-shaped catch section 15c, which is configured to protrude in a direction preferably transverse to the longitudinal axis L and towards

the bushing 2. The bushing 2 has preferably a recess 2e complementarily configured to the catch section 15c. This means, the catch section 15c latches so to speak with the recess 2e. From a certain expenditure of force on, the catch section 15c and the recess 2e are configured such as to be able to engage and/or disengage, thus facilitating dismounting and mounting.

As an alternative, the screw section 15, even though not illustrated in the Figures, has a recess similar to the recess 2e, and the bushing 2 has a projection which is essentially complementary to this recess.

Again as an alternative, the catch section 15c, as shown in Figure 2, is configured by means of a projection which sits flat on the bushing 2 in a clamping manner. This means, entraining the bushing 2 by means of the screw section 15 is realized by means of the action of clamping or friction.

Again as an alternative, the catch section 15c, as shown in Figure 3, is likewise configured by means of a recess, such that a hollow space is created between the recesses 2e and 15c. A catch part 23, which has preferably the shape of a ring, is inserted in this advantageously ring-shaped hollow space.

The ring shape is advantageous, because the screw section 15 is rotated with regard to the bushing 2.

The task of the screw section 15 will now be explained based on the Figures 2 and 3. If the screw section 15 is in the condition shown in Figure 2, the hydraulic fluid H, coming from the hydraulic line 9, can flow almost unhindered in the hydraulic connection 7, because they are both almost aligned with each other. In the condition shown in Figure 3, however, in which the screw section 15 is moved further in the direction of the hydraulic line 9, the hydraulic fluid H, coming from the hydraulic line 9, initially has to pass through a relatively narrow interspace 22 between the attachment block 10 and the bushing 2, before reaching the hydraulic connection 7. The flow of fluid is thereby considerably impeded. As a consequence, the return spring 4 needs to deploy less force in order to press the stop face 5 of the slide 3 against the counter-edge 6 of the bushing 2 in a fluid-sealing manner. In addition, this narrowing allows for damping the movement of the connected door leaf. Obviously, the interspace 22 may be configured in that the flow of fluid is barely or not at all impeded. As a result, a valve 1 has been provided in which the damping and blocking action can be adjusted. The screw section 15 thus provides a simple option accessible from the outside to allow for adapting the valve 1 to the respective door actuating device.

The screw section 15 has yet another decisive advantage. The attachment block 10 is simply moved when being

inserted into the housing 13 and, if required, when being removed from it. Otherwise, the attachment block 10 is stationarily disposed with regard to the housing 13. This means, the seals 20, 21 slide along the housing to a negligible low degree. This means, they are subject to little or no mechanical wear at all and therefore last for a long time. This is not the case at least for the seal 18. During each opening and/or closing procedure, the piston 24 of the door actuating device, for example the working piston, in the Figures partially illustrated, pushes against an abutment surface 3g of the valve body 3 and, should the occasion arise, presses the latter in the direction of the screw section 15. During each movement of the valve body 3, the seal 18 thereby slides along the facing contact surface of the bushing 2 and is therefore subject to relatively high wear. As a consequence, the seal 18 needs to be replaced if necessary. On account of the screw section 15, not the entire valve 1, but only the screw section 15 with the bushing 2 and the valve body 3 need to be unscrewed. Thus maintenance cost decreases and maintenance itself is simplified.

As shown in Figure 3, the housing 13 is slightly modified. As can be seen, the housing 13 essentially resembles the housing 13 of Figures 1 and 2. However, compared to these Figures, the hydraulic line 12 is configured to be offset to the right. The significance of the relatively wide recess 11 along the longitudinal axis L becomes now

apparent. On account of this width, the valve 1 can be employed in housings 13 with differently configured hydraulic lines 12, as long as the respective hydraulic line 12, with the valve 1 being inserted, is in hydraulic communication with the recess 11 of the attachment block 10, thus an exchange of hydraulic fluid is possible between the hydraulic line 12 and the recess 11. This means, the recess 11 improves the universal utilization of the valve 1.

On account of the operative connection between the stop face 5 and the counter-edge 6, a valve 1 has been provided which can be inserted into a door actuating device and removed therefrom in a simple way. Therefore, the valve 1 can be employed as both an arresting device and a blocking device together with a closing sequence control. In this case, the piston 24 is replaced by an actuating member, not illustrated in detail, of the closing sequence control or builds this actuating device, which can be activated by a door actuating device associated to the inactive leaf, such that the valve 1 of the active leaf disables or enables the flow of hydraulic fluid and thus effects an arresting or release of the door actuating device associated to the active leaf, and therefore of the door.

As shown in Figure 1, the hydraulic fluid H, coming from the hydraulic line 12, either flows in the direction of the piston 24 or in the opposite direction, via an interspace 25, present between the bushing 2 and the slide 3, and a

through-opening 3d within the slide 3, which opening is configured to be continuous. The through-opening 3d serves to lead the hydraulic fluid H from the outside in the direction of the recess 14, or vice versa. If the piston 24 is in the position illustrated in Figure 2, it may be that it rests flat against exterior surfaces 2f of the bushing 2 opposite the piston, such that the flow of hydraulic fluid in this area is either considerably impeded or blocked. In order to avoid this, according to Figure 1, by way of example the piston has a through-opening 24a, which is configured with regard to the through-opening 3d in such a way that the hydraulic fluid H is able to flow therethrough. The flow of hydraulic fluid H through the piston 24 is indicated by means of a double arrow.

As an alternative, the piston 24, as illustrated in Figure 3, has a groove-shaped recess 24b, through which the hydraulic fluid H, coming from the through-opening 3d, is evacuated laterally from the piston 24, respectively coming from the sides of the piston 24, is guided by and through the recess 24b to the through-opening 3d, as likewise indicated by a double arrow.

As an alternative, at the end facing the piston 24, as illustrated in Figure 2, the slide 3 has a recess 3e, configured analogously to the recess 24b. In addition or as an alternative, at the end facing the piston 24, as likewise illustrated in Figure 2, the bushing 2 as well may have a

recess 2g, configured analogously to the recess 24b. The fluid streams through the slide 3 and the bushing 2 in this terminal area are again indicated by double arrows. This configuration allows for utilization in door actuating devices with a completely sealing piston 24, which widens the areas of application.

As can be seen in particular in Figure 1, the attachment block 10 has preferably a male thread section 10e, by means of which it is screwed into a complementarily configured female thread section 13c of the housing 13 of the door actuator. For this purpose, the attachment block 10 as well has preferably a screw section 10f, which has preferably a non-round exterior contour, for example in the shape of an exterior hexagon. The attachment block 10 can thereby be firmly screwed to the housing 13 in a simple way for example by means of a box end wrench. This means, the attachment block 10 fixes the valve 1 in the door actuator, whereas the screw section 15, in conjunction with the bushing 2, allows for adapting the valve to the door actuator, as described above. As can be seen furthermore in the Figures 1 to 3, transverse to the longitudinal axis L, the screw section 10f has an exterior dimension which is larger than an exterior dimension of the male thread section 10e. An abutment is created thereby, such that the screw section 10f can not be moved too far into the female thread section 13c of the housing 13 and thereby the attachment block 10 can not be moved too far into the

housing 13. In addition, the screw section 10f simplifies mounting, because the screw section just needs to be screwed tight, without having to respect any dimensions.

Figure 4 shows a valve 1 according to a second embodiment of the invention in a section analogously to the Figures 1 to 3. This valve differs from the previous embodiments essentially by the differently disposed return spring 4. The spring is disposed, in a pre-tensioned state, in the interspace 25 between the valve body 3, the bushing 2 and the screw section 15 along the longitudinal displaceability path of the valve body 3 in the direction away from the screw section 15. This means, the return spring 4 presses again the valve body 3, namely the stop face 5 thereof, against the counter-edge 6 of the bushing 2. This means, the spring abutment 17 as well as the recesses 2a and 3a can be foregone. Therefore the valve body 3 and the bushing 2 can be configured considerably shorter than in the previously described variants. The rest of the valve 1 is configured according to the above described embodiments. By way of example, Figure 4 shows the configuration according to Figure 3.

Figure 5 shows a valve according to a third embodiment of the invention. As can be seen, by way of example, the bushing 2 and the screw section 15 are integrally configured. The valve 1 has the spring abutment 17, the recesses 2a and 3a and the return spring 4 according to

the first embodiment of the invention, respectively it has a distance piece instead, as well as the return spring 4 according to the second embodiment of the invention. In case of the additional return spring 4, both return springs 4 can be configured to be weaker or their combined return force can be increased. In addition, on account of the return spring 4 disposed in the interspace 25, a basic return action is the result, even if the second return spring 4 would be removed or exchanged. The second return spring 4 thus only serves for fine adjustment of the return force, as long as the spring abutment 17 is configured to be adjustable, as illustrated by way of example in Figure 5.

In addition, it is not the screw section 15, but the bushing 2 that is screwed to the attachment block 10. In this case, at the side of the seal 19 facing away from the screw section 15, the attachment block 10 has at least one configured female thread section 10g, into which the bushing 2 is screwed with a male thread section 2i. The advantage is that the seal 16 is not bearing in a sealing manner against a thread, but against an essentially smooth and flat interior surface, which is advantageous in terms of longevity of the seal 16.

The invention is not limited to the above described embodiments.

The attachment block 10 may be configured integrally with the housing 13 such that the valve 1 essentially consists of only the bushing 2, the valve body 3, the return spring 4, and the preferably present seals 16, 18 and 19, and the spring abutment 17.

Instead of the above described screw connection between the attachment block 10 and the housing 13, pressure bonding, latching or else a permanent connection, for example by means of bonding, may be provided.

The hydraulic lines 9, 12 and the hydraulic connection 7, may be configured respectively once or they may be configured several times in a radial shape, following the cross-section of the bushing 2, such that the extending straight lines are approximately incident on the centre of the valve 1, namely on the longitudinal axis L illustrated in the Figures. This is in particular the case with surroundingly configured recesses.

In addition to the written disclosure of the invention, it is herewith explicitly referred to the illustrated drawings of the invention in the Figures 1 to 3.

As a result, the invention provides a universally applicable valve for a hydraulic based door actuating device, which valve is easy to install, as well as adaptable to the respective conditions of application, and by means of elements already installed in the door actuating device,

needs to be purely mechanically activated in only one direction for releasing the flow of hydraulic fluid, and automatically reaches the arresting, respectively the blocking position, namely without any further cooperation of potential additional elements from outside. This means, the invention provides an adjustable non-return valve for application in hydraulic door actuating devices.

List of reference numerals

1	valve
2	bushing
2a	recess
2b	spring abutment
2c	groove
2d	guiding recess
2e	recess
2f	exterior surface
2g	recess
2h	guiding projection
2i	male thread section
3	valve body
3a	recess
3b	groove
3c	groove
3d	through-opening
3e	recess
3f	male thread section
3g	abutment surface
3h	blind end bore
4	return spring
5	stop face
6	counter-edge
7	hydraulic connection
8	recess
9	hydraulic line

10	attachment block
10a	female thread section
10b	groove
10c	groove
10d	guiding recess
10e	male thread section
10f	screw section
10g	female thread section
11	recess
12	hydraulic line
13	housing
13a	groove
13b	guiding projection
13c	female thread section
14	recess
15	screw section
15a	male thread section
15b	groove
15c	catch section
16	seal
17	spring abutment
18	seal
19	seal
20	seal
21	seal
22	interspace
23	catch part
24	piston

24a	through-opening
24b	recess
25	interspace
ÖF	opening direction/direction of fluid flow
L	longitudinal axis
H	hydraulic fluid
α	angle of the stop face 5 with regard to the longitudinal axis L

Claims

1. A valve (1) for a hydraulic door actuating device, wherein
 - the door actuating device
 - is adapted to open and/or to close a connected door, and
 - has a housing (13), and
 - the valve (1)
 - is adapted to be inserted into the housing (13) of the door actuating device and to influence a flow of hydraulic fluid (H) in the door actuating device, and comprises
 - a bushing (2), and
 - a slide (3), which is guided to be longitudinally displaceable in the bushing (2),

characterized in that

 - the slide (3)
 - is pre-tensioned by a return spring (4) along the longitudinal displaceability path of the bushing (2),
 - has a stop face (5), by means of which, on account of the action of the return spring (4), the slide bears against a counter-edge (6) configured at the bushing (2) in a fluid-sealing manner and thereby blocks the flow of hydraulic fluid (H), and

- is configured to be mechanically charged from the outside against the action of the return spring (4) and away from the counter edge (6).

2. A valve (1) according to claim 1, **characterized in that**, with an end facing away from the return spring (4), the slide (3) is configured to protrude from the bushing (2).
3. A valve (1) according to claim 1 or 2, **characterized in that** the stop face (5) is disposed at an angle (α) inclined with regard to the longitudinal axis (L).
4. A valve (1) according to one of the preceding claims, **characterized in that**, at a side facing the bushing (2), the slide (3) has a recess (14), which
 - is delimited at one side by the stop face (5),
 - extends along the longitudinal displaceability path of the slide (3), such that the slide (3) together with the bushing (2) encloses a hollow space, and
 - is hydraulically connected to the hydraulic connection (7) of the bushing (2).

5. A valve (1) according to one of the preceding claims, **characterized in that** the valve comprises an attachment block (10),
 - into which the bushing (2) is inserted, and
 - which is configured to be stationarily inserted into the door actuating device.
6. A valve (1) according to claim 5, **characterized in that**, at a side facing the housing (13) of the door actuating device, the attachment block (10) has a recess (11), which
 - extends in the housing (13) of the door actuating device along an inserting direction of the attachment block such that the attachment block (10) together with the housing (13) encloses a hollow space, and
 - is hydraulically connected to both the hydraulic line (9) of the attachment block (10) and to the hydraulic line (12) of the housing (13).
7. A valve (1) according to claim 5 or 6, **characterized in that** the valve furthermore comprises an adjusting section (15), which
 - is disposed to be longitudinally movable in the attachment block (10), and
 - is in engagement with the bushing (12) in such a way that, during its longitudinal movement in

the attachment block (10), it entrains the bushing (2).

8. A valve (1) according to claim 7, **characterized in that** the adjusting section (15) and the bushing (2) are configured to be integral.
9. A valve (1) according to claim 7 or 8, **characterized in that** the adjusting section (15) is disposed in the attachment block (10) to be freely rotatable.
10. A valve (1) according to one of the claims 5 to 9, **characterized in that**, at a side facing the attachment block (10), the bushing (2) has a recess (8), which
 - extends along the longitudinal movability path of the adjusting section (15) such that the bushing (2) together with the attachment block (10) encloses a hollow space, and
 - is hydraulically connected to both the hydraulic connection (7) of the bushing (2) and to a hydraulic line (9) of the attachment block (10).
11. A valve (1) according to claim 4, 6 or 10, **characterized in that** at least one recess (8, 11, 14) is configured to be surrounding.

12. A valve (1) according to one of the preceding claims, **characterized in that** the slide (3) has a through-opening (3d), which
 - is hydraulically connected to an interspace (25) between the counter-edge (6) of the slide (3) and the bushing (2), and
 - extends in the direction of an actuating element (24) of the door actuating device or of a closing sequence control.
13. A valve (1) according to claim 12, **characterized in that**, at an end facing away from the interspace (25), the slide (3) has a recess or opening (3e), which essentially extends transversely to the longitudinal displaceability path of the slide (3), and is configured to be continuous leading away from the through-opening (3d).
14. A valve (1) according to claim 13, **characterized in that**, at an end facing away from the interspace (25), the bushing (2) has a recess or an opening (2g), which essentially extends parallel to the longitudinal extension of the recess (3e), is configured to be continuous and is hydraulically connected to the recess or to the opening (3e).

15. A door actuating device,
- adapted to hydraulically open and/or to close a connected door, and
 - having
 - a housing (13),
 - a hydraulic circuit through which hydraulic fluid is forced to move, if the door actuating device performs an opening movement, respectively a closing movement, and
 - a valve (1) according to one of the preceding claims.
 - which is incorporated into the hydraulic circuit of the door actuating device in such a way that, on account of the action of the return spring (4), it blocks the flow of hydraulic fluid (H) in the hydraulic circuit, and
 - the slide (3) of the valve is mechanically charged, by means of an actuating device (24) of the door actuating device during the opening movement or closing movement, and is therefore urged to move away from the counter-edge (6) in the direction of the return spring (4).