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Title: Door Closer

Description

The invention relates to a door closer according to the generic part of claim 1.

- 5 Such door closer type is known under the designation "DORMA TS 77" and is approved thanks to its reliability and the numerous practical application possibilities. The door closer may be mounted on the inner or outer side of a door leaf as well as on a door frame. Generally, mounting the door closer on the door
10 leaf's inside is problematic, as the door leaf, on opening is moved in the direction of the adjoining wall and the door closer is then located between the door leaf and this wall. When the opening angle is too important, the door closer incurs the danger to impact on and to damage the adjoining wall, especially when the
15 door is mounted in a corner of a room or in a thick wall. For the above-mentioned applications, it is suitable to limit the opening angle. It is therefore worth striving for compact door closers presenting simultaneously a minimum overall height, while maintaining the existent application variety as well as their
20 different features.

- The already known door closer's external dimensions, especially the overall height, are, due to the specific inside conception, relatively important resulting in increased package material consumption for packaging and furthermore demanding
25 important stock and transportation space. The door closer's exterior edged shape involves manufacturing problems with regard to hollow spaces in the material and is not acceptable as to an economic use of material.

- 30 The problem of the invention is to improve a door closer according to the generic part of claim 1 such to provide a compact and aesthetic unit that may be manufactured with a minimum amount of material.

- 35 The features described in the characterising part of claim 1 solve the problem. More inventional beneficial developments are characterised by the sub-claims.

- 40 The object of claim 1 presents the advantage that a reduced overall height will be realised with an externally compact shaped door closer. Thus the door closer is also suitable for use under restricted or inopportune mounting conditions with regard to a limited door leaf opening angle. Generally, a door closer will be preferred which mechanical and hydraulic units are arranged lengthwise in a corresponding channel of the body.

Although for the invention body the material consumption is extremely reduced, all characteristics with regard to strength and functionality are guaranteed. Wall thickness is reduced to a minimum. The resulting exterior contours are aesthetically designed featuring smooth and seamless transitions. The body becomes oblong due to the serial arrangement of its functional units, whereby the lateral faces adapt to the channel's contours. Ideally the lateral faces take a curved or bevelled course. The exterior contour's smooth course especially of the lateral faces and of the bearing blocks to be explained hereinafter considerably reduces material consumption and problems related to casting technique.

With the intention to obtain sufficiently stable drive shaft's outlet openings, the lateral faces present massive block typed reinforcements, that, as far as they are concerned, are designed material saving. The connection of these so-called bearing blocks to the body's lower part is exceptionally advantageous. The drive shaft is arranged such to allow mounting the door closer in different positions.

Further more the drive shaft is supported and fixed in a suitable axle bore-hole in a manner that allows easy assembling and reduces material consumption.

The reduced external dimensions decrease the required amount of package material and simultaneously the space required for stock and on transportation. Reduced volume and weight increase packaging density during transportation and furthermore facilitate handling for the fitter on site. Moreover, the aforementioned characteristics considerably contribute to reduce production cost.

Hereinafter the invention is explained on the basis of possible execution examples represented by diagrams.

Figure 1 shows: A perspective view of the door closer.

Figure 2 shows: A frontal view of the door closer according to figure 1.

Figure 3 shows: A view from below of the door closer according to figure 1.

Figure 4 shows: A vertical longitudinal section of the door closer according to figure 1.

Figure 5 shows: A horizontal longitudinal section of the door closer according to figure 1.

Figure 6 shows: A perspective view of a second door closer execution example.

Figure 7 shows: A frontal view of the door closer according to figure 4.

Figure 8 shows: A perspective view of a third door closer execution example.

5 Figure 9 shows: A front view of a door closer according to figure 6.

10 In the figures, identical construction units are identified by the same references. Door closers 1 represented in the different figures are foundry manufactured in one piece and consist for example of aluminium or steel. Despite the optimisation aspect to minimise material consumption while maintaining the body's stability, the body 2 is not massive. Generally, all exterior contours and transition surfaces are designed with rounded forms.

15 The door closers 1 are equipped to receive respectively mechanical and hydraulic functional units, which are mounted as already known in linear extension of the body 2 in a channel 21 with the intention to reduce the overall height. A shaft 22 connects the mechanical unit in the body 2 with a rod assembly
20 outside the body 2. The shaft 22 is conducted out of the body 2 at both ends to allow variable mounting of the door closer 1 and the rod assembly with regard to the door leaf and the door frame depending on mounting conditions. For clarity's sake the rod assembly and the mechanical and hydraulic functional units are
25 not represented.

A piston 23 and a closing spring 24 are coupled to each other in a displaceable way inside the oblong body 2. The shaft 22 is rotatably supported in the body 2 and presents in its center a
30 toothed wheel 25, which collaborates with a rack 26 inside the piston 23 developed in one piece. Outside the body 2, the shaft 22 is coupled with the non-represented rod assembly.

When opening the door, the shaft 22 is twisted via the rod assembly coupled to the door. The piston 23 is moved in horizontal direction and compresses the closing spring 24. The
35 accumulated opening energy is released, as soon as the door is set free, as the closing spring 24 unbends and presses the piston 23 in the opposite direction. Through the conversion of the linear movement into a rotation the door is closed again. Hydraulic oil is used inside the body 2 as damping medium.

40 The body 2 presents an axial axle bore-hole 27 to support and connect the shaft 22. The axle bore-hole 27 has a round cross section. According to figure 5, the axle bore-hole's 27 upper part presents an edge 28 reducing the cross section. According to the figures, the axle bore-hole's 27 lower part displays a groove
45 29 for a washer 30. The shaft 22 is designed symmetrically and

shows a toothed wheel 25 in its center. Discs 31, 31' are pre-mounted on both sides of the toothed wheel 25. Devices for attaching the rod assembly are found at both shaft 22 extremities. Indeed the rod assembly is mounted on only one extremity, but
5 depending on the mounting situation, it may be installed on the other extremity. So-called sintering bushings 32, 32', made of ceramics, are employed for bearing purposes on both shaft 22 ends. A tube shaped bearing shell 33 presents a graduated cross section that ends into an edge border 34. The bearing
10 shell's 33 external faces are at least partially radially enlarged.

Hereinafter follows the description how to mount the door closer 1. First a washer 35 is inserted into the bearing shell 33 that represents a pre-mounted unit, and pushed against the edge border 34, and then the sintering bushing 32 is pressed non-
15 detachably against the washer 35. Once the shaping process is finished, a washer 35 and the sintering bushing 32 are fixed non-detachably in the axle bore-hole's 27 upper part. The washer 30 is inserted into the axle bore-hole's 27 groove in the lower part. After having placed the closer spring 24 and the piston 23 in the
20 channel 21, the shaft 22 is put in place through the axle bore-hole's 27 lower part. The shaft 22 slides into the axle bore-hole 27 through the sintering bushing 32 until it hits the channel 21 with the disc 31. The shaft 22 is completely supported and fixed once the bearing shell 33 is placed. The pre-mounted bearing
25 shell 33 is pushed on the shaft 22 and by means of a pre-determined pressure, it is definitively positioned in the body 2 and on the shaft 22. Initially the sintering bushing 32 slides on the shaft 22 and on the bearing shell's 33 external faces along the axle bore-hole's 27 inside wall. Due to the partially enlarged
30 bearing shell 33, preferably with a projection, the body 2 surrounding the axle bore-hole 27 is elastically pressed towards the outside. Once passed the groove 29, the body 2 and the projection spring back and the bearing shell 33 is fastened. The shaft 22 is simultaneously axially positioned by the sintering
35 bushing 32 sitting closely to the disc 31.

The body 2 is principally of oblong shape. It presents an upper surface 3 with regard to a lower surface 4. Mounting plates 9, 10 are developed on the lower surface 4 in longitudinal extension, serving to fix the body 2 on a door leaf or a door frame. In
40 longitudinal extension, the lower surface 4 and the upper surface 3 are linked by means of lateral faces 5, 6. The fore-parts 7, 8 are placed vertically with regard to the lateral faces 5, 6 and to the lower surface 4 and the upper surface 3 and limit the body 2 in the longitudinal extension. The mounting plates 9, 10 project
45 the body 2 at the fore-parts 7, 8.

The execution example according to figures 1 — 3 presents the following particularities. When looking at the lower surface 4, the lateral faces 5, 6 show an almost convex curvature, body inwards, and they end at the upper surface 3. The curvature exhibits a parabola type course, whereby the upper surface 3 limits this course. The transition areas between the lateral faces 5, 6 and the upper surface 3 are built by small radii.

The shaft is located in the center between the upper surface 3 and the lower surface 4 and off center between the fore-parts 7, 8. This shaft 22 arrangement allows a large variety of mountings for the door closer 1, for example mirror-imaged. The shaft projects the body 2 at both lateral faces 5, 6 exactly at bearing blocks 11, 12. The bearing blocks 11, 12 are developed as massive and one-piece part sitting at the body 2, with the intention to guarantee a stable shaft bearing. The bearing blocks 11, 12 show trapezoidal fronts 13, 14 running vertically with regard to the lower surface 4, whereas the larger base sides 15, 16 are found at the lower surface 4. The bearing block's 11, 12 trapezoidal cross section continues at a slightly enlarged scale from the fronts 13, 14 as far as to the lateral faces 5, 6. The bearing blocks 11, 12 are dimensioned such to not project the upper surface 3.

Figures 6 and 7 represent a body 2, which lateral faces 5, 6 also exhibit a parabola shape. The upper surface 3 is slightly vaulted body outwards, saving again cast material. The transition areas between the lateral faces 5, 6 and the upper surface 3 also present small radii. The bearing blocks 11, 12 have got U-shaped fronts 13, 14 whereby the open sides 17, 18 are located at the lower surface 4. The bearing blocks' 11, 12 U-shaped cross section is slightly enlarged in the direction of the lateral faces 5, 6. The mounting plates 9, 10 are conceived bevelled in order to save material.

Figures 8 and 9 display a body 2, which lateral faces 5, 6 present differing curvatures. The lateral face 5 shows, as already described in the execution example according to figures 1 — 3, a parabola shape and is limited at a plane upper surface 3. The lateral face 6 presents a different shaped parabola compared to the lateral face 5, in that the lateral face 6 progresses into the upper surface 3, without showing any transition area. Thus on the one side, the upper surface 3 is plane and on the other side it is convex.

All three execution examples have in common, as revealed in figure 3, that they present two bore-holes 19, 20 on the lower surface 4. After the casting process, during manufacturing, these bore-holes 19, 20 allow an exact centring and fixing of the machined part for the different workshops. Especially in

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continued mechanical manufacturing, miss-adjustments of the machined part are eliminated.

References:

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| | 1 | Door closer |
| | 2 | Body |
| | 3 | Upper surface |
| 5 | 4 | Lower surface |
| | 5 | Lateral face |
| | 6 | Lateral face |
| | 7 | Fore-part |
| | 8 | Fore-part |
| 10 | 9 | Mounting plate |
| | 10 | Mounting plate |
| | 11 | Bearing block |
| | 12 | Bearing block |
| | 13 | Front |
| 15 | 14 | Front |
| | 15 | Base side |
| | 16 | Base side |
| | 17 | Open side |
| | 18 | Open side |
| 20 | 19 | Bore-hole |
| | 20 | Bore-hole |
| | 21 | Channel |
| | 22 | Shaft |
| | 23 | Piston |
| 25 | 24 | Closing spring |
| | 25 | Toothed wheel |
| | 26 | Toothed rod |
| | 27 | Axle bore-hole |
| | 28 | Edge |
| 30 | 29 | Groove |
| | 30 | Washer |
| | 31,31 | Disc |
| | 32,32 | Sintering bushing |
| | 33 | Bearing shell |
| 35 | 34 | Edge border |
| | 35,35 | Washer |

Claims

- 1) Door closer (1) with an oblong one-piece body (2)
- which presents an upper surface (3) parallel with
regard to a lower surface (4), two opposite lateral
faces (5, 6) connecting the lower surface (4) and
the upper surface (3), and two fore-parts (7, 8)
limiting the body (2) in its longitudinal extension,
- which in longitudinal extension on the lower
surface (4) displays mounting plates (9, 10)
sticking out from the fore-parts (7, 8) and
- which features bearing blocks (11, 12) at both
lateral faces (5, 6) in which a drive shaft (22), is
rotatably supported to be connected to a rod
assembly,
characterised in that
- the lateral faces (5, 6) take a curved and/or
bevelled course towards each other, starting at the
lower surface (4) and ending at the upper surface
(3), and in that the bearing blocks (11, 12) are built
between their fronts (13, 14) and lateral faces (5,
6) ascending from the lower surface (4).
- 2) Door closer (1) according to claim 1, characterised in
that the lateral faces (5, 6) present each a differing
curvature and/or bevel course.
- 3) Door closer (1) according to claim 1 or 2,
characterised in that the lateral faces (5, 6) describe
a parabola shape.
- 4) Door closer (1) according to one of the claims 1 to 3,
characterised in that the upper surface (3) is at least
partially convex.
- 5) Door closer (1) according to one of the claims 1 to 4,
characterised in that the bearing blocks (11, 12)
present the shape of its fronts (13, 14).
- 6) Door closer (1) according to one of the claims 1 to 5,
characterised in that the fronts (13, 14) are oriented
vertically towards the lower surface (4).
- 7) Door closer (1) according to one of the claims 1 to 6,
characterised in that the fronts (13, 14) have got a
trapezoidal or U shape.
- 8) Door closer (1) according to one of the claims 1 to 7,
characterised in that the bearing blocks (11, 12) do
not project the upper surface (3).
- 9) Door closer (1) according to one of claims the 1 to 8,
characterised in that the drive shaft (22) is located in
the center between the lower surface (4) and the
upper surface (3).

- 10) Door closer (1) according to one of the claims 1 to 9, characterised in that bore-holes (19, 20) are integrated in the lower surface (4).
- 5 11) Door closer (1) according to one of the claims 1 to 10, characterised in that the body (2) is made of cast material without having a massive shape.
- 10 12) Door closer (1) according to one of the claims 1 to 10, characterised in that the shaft (22) is rotatably supported in a bearing shell (33) on one side and the bearing shell (33) may be inserted in the axle bore-hole (27) while having an elastic movement of the body (2) and may be fixed on its return spring operation.
- 15 13) Door closer (1) according to claim 12, characterised in that the shaft (22) has at least partially a larger diameter as the axle bore-hole (27).