

PLASTIC DOOR CLOSER HAVING INSERTED METAL PARTS

Description

- 5 The invention relates to a plastic door closer with metal inserts.

In the state-of-the-art it is known to manufacture a door closer completely from plastic material. However, this leads
10 to various problems.

In a pure plastic embodiment, increased abrasion can be observed between the piston and the shaft toothing. Furthermore, the axle bearing bushings very often have
15 deep scores and a shoulder, which is formed at the end of the piston stroke in the cylinder compartment of plastic door closers. In addition, oil leakage can be observed at the screwed sealing plug.

- 20 Therefore, it is the object of the present invention to provide a door closer, which has a long life span while being manufactured in a simple and cost-effective manner.

The solution of this problem is achieved by the features of
25 claim 1. The dependent claims show advantageous developments of the invention.

According to the invention, the door closer comprises thus a housing, a closing piston, a closer shaft vertical to the central axis of the closing piston, and a spring. In this case,
5 the closing piston is disposed in a cylindrical pocket and the closer shaft in a cylindrical opening in the housing. Furthermore, the closing piston meshes with the closer shaft and the spring acts upon the closing piston. The housing is essentially made from plastic material, wherein
10 the cylindrical pocket of the housing comprises at least one first metal insert. The closing piston is likewise made essentially from plastic material, wherein a second metal insert constitutes, at least partially, the circumferential surface of the closing piston.

15 On account of the metal inserts, for example a cylinder liner made from steel or from aluminium alloy, the piston moves in a pure metal environment. The problems known from the state-of-the-art, and caused by pairing metal and plastic material, are thereby eliminated. As the cylinder
20 liner absorbs high loads, an inexpensive plastic material can be chosen as supporting material. In particular in view of high prices for raw material, such as aluminium and steel, this combination of plastic material and metal running surfaces represents a particularly efficient solution for a
25 door closer having a long life span.

In an advantageous embodiment, it is provided that the closer shaft is essentially made from plastic material, wherein a third metal insert constitutes the toothing of the closer shaft and a fourth metal insert constitutes the toothing of the closing piston. Thus the closer shaft can be manufactured from an inexpensive plastic material and yet has an effective toothing made from metal. Obviously, the second metal insert of the circumferential surface of the closing piston and the fourth metal insert for the toothing of the closing piston may be integrally configured.

In an advantageous embodiment, it is furthermore provided that the first metal insert of the cylindrical pocket has a female thread for a screwed sealing plug to be screwed in. In terms of oil leakage, the metal thread pairing is tighter and able to withstand a higher oil pressure.

It is in particular advantageous to coat the metal inserts with the plastic material. By coating insertable parts, compound parts are produced, which very often can not be produced in a normal injection moulding process, for example because functions are to be incorporated into the plastic material. Compound parts are created, in which diverse materials are combined with the plastic material. The reason to produce such combinations is to link differing features with regard to strength, conductivity,

insulation or weight. Bulky insertable parts, which can only be insufficiently maintained in a positive engagement from the bottom to the top, require to provide special vertical structural shapes of an injection moulding machine. These
5 structural shapes are provided with a solid vertical closing system, which keeps a constant height during the advance movement. In the plastic injection moulding process for small production runs (less than 50,000 pieces), insertable parts are manually inserted into the tool. In larger
10 production runs, advantageously a robot assumes this task. Shorter cycle times are thus possible.

It is furthermore advantageous to configure at least one metal insert to be squared on the side facing the plastic
15 material, in order to prevent the metal insert from rotating. Consequently, in the cylindrical opening of the housing, for example a cylinder liner may have a hexagon on its outside. This hexagon is coated with plastic material and thus supported to be protected against rotation.

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It is likewise advantageous to connect at least one metal insert to the plastic material by means of press fit and/or snap seat and/or ultra-sound welding.

25 In an advantageous configuration, at least one metal insert is connected to the plastic material by adhesive, in

particular by thermo-active adhesive. Metallic inserts can be anchored within the injection-moulded part by means of a thermo-active adhesive, which has been previously applied to the metal part and dried thereon. During the
5 injection moulding process, the hot plastic melt triggers the bonding process.

Steel and/or aluminium, respectively an alloy including those metals, are provided as advantageous materials for
10 the metal inserts.

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

Figure 1: shows a perspective illustration of an inventive door closer,

20 Figure 2: shows a detailed view of the inventive door closer of Figure 1,

Figure 3: shows a detailed view of a cylinder liner of Figure 2, and

Figure 4: shows the cylinder liner with a screwed sealing plug of Figure 3.

An inventive door closer is illustrated in the Figures.

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As shown in Figure 1, the inventive door closer 1 consists of a housing 2 with a cylindrical pocket 4 and a cylindrical opening 6. Furthermore, a closing piston 3, a screwed sealing plug 9, and a spring 7 can be seen. Figure 1 shows
10 furthermore a closer shaft 5 having an exterior toothing 19, and a bearing bushing 8. The closer shaft 5 is rotatably supported with the bearing bushing 8 in the cylindrical opening 6. The closing piston 3 glides in the cylindrical pocket 4, wherein the exterior toothing 19 of the closer
15 shaft 5 is in operative connection with a toothing 18 (Figure 2) of the closing piston 3.

When mounting, at first the spring 7 is pushed into the cylindrical pocket. Thereupon, the closing piston 3 is
20 inserted. On its rear side, the cylindrical pocket 4 is closed, and therefore the spring 7 can act upon the closing piston 3. When completing the mounting process of the inventive door closer 1, the cylindrical pocket 4 is filled with oil and closed by the screwed sealing plug 9.

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Figure 2 shows a partial view of the inventive door closer 1 of Figure 1. In this case, a cylinder liner 10 and the closing piston 3 can be seen. The closing piston 3 has furthermore a frontal metal ring 11a and a rear metal ring 11b, a central
5 cylindrical surface 12, a frontal control bore 13, and a rear control bore 14, as well as an internal toothing 18.

Prior to injection-mould the housing 2, the cylinder liner 10 has been inserted into an injection mould tool and
10 consequently it is coated with the plastic material. The cylinder liner 10 thus forms a running surface for the closing piston 3. When producing the closing piston 3, three metal insert are coated with the plastic material. The frontal metal ring 11a and the rear metal ring 11b thus slide
15 in the cylinder liner 10 in the cylindrical pocket 4. In order to guarantee an abrasion-proof meshing between the closing piston 3 and the closer shaft 5, the toothing 18 in the closing piston 3 is produced as a metal insert.

20 Figure 3 shows the cylinder liner 10 in detail. In this case, the through-bore 16 as well as the hexagon 15 can be seen. During assembly, the through-bore 16 is brought into a congruent disposition with the cylindrical opening 6 of the housing. The closer shaft 5 can thus act upon the closing
25 piston 3 through the through-bore 16. The cylinder liner 10 is completely coated with the plastic material during the

production process. Due to the hexagon 15, the cylinder liner 10 is torque-proof supported in the plastic material.

Figure 4 shows another view of the cylinder liner 10 with
5 the screwed sealing plug 9. In this case, a female thread 17 is provided in the cylinder liner 10. The female thread 17 is advantageously cut into the cylinder liner 10 prior to coating the cylinder liner 10 with the plastic material. The metallic screwed sealing plug 9 is screwed into the female
10 thread 17 for sealing the housing 2 in an oil-tight manner. As an alternative, it is likewise possible to manufacture the screwed sealing plug 9 from plastic material, wherein advantageously the male thread of the screwed sealing plug 9 is provided as a metal insert.

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The invention thus illustrates one possibility to combine the advantages of metal and plastic material in a door closer. On account of the plastic material, the inventive door closer is relatively light and inexpensive. By utilizing metal inserts,
20 in particular at running surfaces, the durability and the precision of the door closer are improved.

List of reference numerals

	1	door closer
	2	housing
5	3	closing piston
	4	cylindrical pocket
	5	closer shaft
	6	cylindrical opening
	7	spring
10	8	bearing bushing
	9	screwed sealing plug
	10	cylinder liner
	11a, 11b	metal rings
	12	central cylindrical surface
15	13, 14	control bores
	15	hexagon
	16	through-bore
	17	female thread
	18	internal toothing
20	19	external toothing

Patent claims

1. A door closer (1), comprising a housing (2), a closing piston (3), a closer shaft (5) vertical with regard to the central axis of the closing piston (3), and a spring (7), wherein the closing piston (3) is disposed in a cylindrical pocket (4) and the closer shaft (5) in a cylindrical opening (6) in the housing (2), wherein the closing piston (3) meshes with the closer shaft (5), wherein the spring (7) acts upon the closing piston (3), wherein the housing (2) and the closing piston (3) are manufactured essentially from plastic material, wherein the cylindrical pocket (4) of the housing (2) comprises at least one first metal insert (10), and wherein a circumferential surface of the closing piston (3) is at least partially formed by a second metal insert (11a, 11b).
2. A door closer, according to claim 1, **characterized in that** the closer shaft (5) is essentially made from plastic material, wherein a third metal insert (19) constitutes the tothing of the closer shaft and a fourth metal insert (18) constitutes the tothing of the closing piston.

3. A door closer according to any of the preceding claims, **characterized in that** the first metal insert (10) of the cylindrical pocket (4) comprises a female thread (17) for screwing in a screwed sealing plug (9).
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4. A door closer according to any of the preceding claims, **characterized in that** at least one metal insert is coated with plastic material.
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5. A door closer according to any of the preceding claims, **characterized in that** at least one metal insert is configured in a square shape (15) on the side facing the plastic material in order to prevent the metal insert from rotating.
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6. A door closer according to any of the preceding claims, **characterized in that** at least one metal insert is connected to the plastic material via press fit and/or snap seat and/or ultra-sound welding process.
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7. A door closer according to any of the preceding claims, **characterized in that** at least one metal insert is connected to the plastic material by
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means of adhesive, in particular by means of thermo-active adhesive.

8. A door closer according to any of the preceding
5 claims, **characterized in that** at least one metal
insert is made from steel or aluminium.