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(54) **Magnet armature**

(57) Magnet armature construction having a ferromagnetic body and an elastomer sealing element. The ferromagnetic body is preferably a cylindrical body, having a lateral surface and two head ends. At least one of the head ends is provided with at least one seat having a bottom surface and a circumferential wall. This seat is shaped in such a manner that a positively locking anchoring with the sealing element is obtained by one or more positively locking geometric formations being pro-

vided in the circumferential wall of the seat. The elastomer sealing element is injection-moulded into this seat. The positively locking anchoring is also effected by at least one cavity being provided in the ferromagnetic body, through the bottom of the seat. The circumferential wall of this cavity is provided with at least one positively locking geometric formation. A part of the elastomer sealing element is injection-moulded into this cavity.

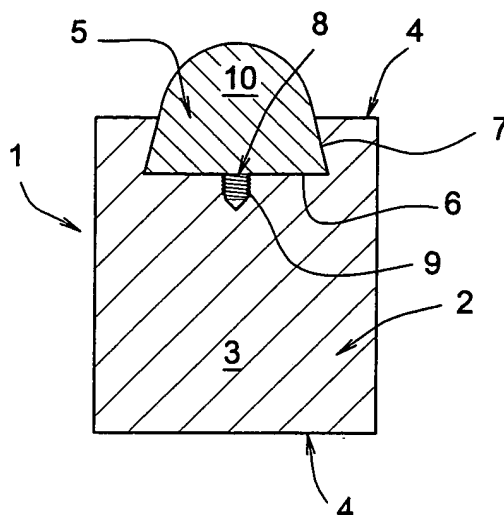


Fig. 1

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Description

[0001] The invention relates to a magnet armature according to the preamble of the main claim.

[0002] A magnet armature of this type is known per se from EP-A-1 224 116.

[0003] This known magnet armature comprises a cylindrical body made of ferromagnetic material having a lateral surface and two head ends. At least one of the head ends is provided with a seat in order to accommodate an elastomer sealing element. This seat consists of a recess with respect to the head end face and has a bottom surface and a circumferential wall. The sealing element is injection-moulded into this seat and preferably extends above the head end of the cylindrical body. According to EP-A-1 224 116, the sealing element is anchored solely in a positively locking manner to the seat. Solely in a positively locking manner means that no additional adhesive agents are provided and no additional anchoring treatments are carried out, resulting in cost savings. The anchoring in a positively locking manner is achieved by providing the circumferential wall of the seat with an undercut, screw thread, toothing or the like. The action of this anchoring is not satisfactory.

[0004] The object of the invention is to provide an improved magnet armature of the type mentioned in the introduction with a satisfactory anchoring of the sealing element.

[0005] This object is achieved by the measures as stated in the characterizing clause of the main claim.

[0006] A small cavity is made in the ferromagnetic material, through the bottom surface of the seat, at the head end of the preferably cylindrical body. This cavity is recessed with respect to the seat, the seat itself being recessed with respect to the head end face. This cavity is preferably cylindrical. The circumferential wall of the cavity is provided with one or more positively locking geometric formations, such as a screw thread or a toothing.

[0007] A non-crosslinked elastomer sealing is injection-moulded into this cavity and into the seat, following which it undergoes a vulcanizing or crosslinking treatment. In the crosslinked state, the section of the elastomer sealing which is in the cavity forms a mechanical anchoring for the elastomer sealing element. In one particular embodiment, both head ends are provided with a seat and an associated elastomer sealing element. Advantageously, both seats are connected to one another by means of an internal duct in the ferromagnetic body, as shown in US2002/0135451 A1. This embodiment has the drawback that the elastomer sealing material which is inside the internal duct may start to behave like an elastic band, as a result of which the sealing elements are no longer firmly anchored to the ferromagnetic body.

[0008] In one embodiment according to the invention, cavities are provided with positively locking geometric formations in the circumferential wall of the cavities,

through the bottom surfaces of both seats. These cavities can be connected to one another by means of an internal duct. As a result of the positively locking formations of the cavities, the sealing elements will remain firmly anchored to the ferromagnetic body.

[0009] The invention will be explained with reference to the drawing, in which:

Fig. 1 shows a cross section through a cylindrical body and an elastomer sealing element of a magnet armature construction according to a first embodiment of the invention;

Fig. 2 shows a perspective view of a cylindrical body of a magnet armature construction according to a first embodiment of the invention;

Fig. 3 shows a cross section through a cylindrical body of a magnet armature construction according to a second embodiment of the magnet armature according to the invention;

Fig. 4 shows an exemplary embodiment of a solenoid valve provided with a magnet armature construction according to the invention;

Fig. 5 shows a vehicle provided with an anti-lock braking system with a magnet armature construction.

[0010] A first embodiment of a magnet armature construction according to the invention is denoted in its entirety in Figs. 1 and 2 by the reference numeral 1. The construction 1 comprises a cylindrical body 2, made of ferromagnetic material. The cylindrical body 2 comprises a lateral surface 3 and two head ends 4. A seat 5 designed as a recess is provided in one of the head ends, which seat comprises a bottom surface 6 and a circumferential wall 7. In the embodiment shown in Fig. 1, the circumferential wall 7 tapers towards the head end 4 of the cylindrical body 2. In the embodiment shown in Fig. 2, the circumferential wall 7 is provided with a screw thread. A cavity 8 is provided in the cylindrical body 2 through the bottom surface 6 of the seat 5, so that the cavity 8 forms a further recess with respect to the head end. This cavity 8 is preferably cylinder-shaped. In the embodiment shown here, the longitudinal axis of the cylinder-shaped cavity 8 runs parallel to the longitudinal axis of the cylindrical body 2. In this case, this cavity is provided with a screw thread 9, but may, in an embodiment which has not been shown, also be provided with other positively locking geometric formations, such as toothing. An elastomer sealing element 10 is injection-moulded into the seat 5 and in the cavity 8, which is indicated in its entirety as being hatched. The elastomer sealing element 10 preferably extends to above the head end 4 of the cylindrical body 2. The diameter of the section of the elastomer sealing element 10 which extends above the head end 4 is not larger than the diameter of the cylindrical body 2.

[0011] Fig. 3 shows a second embodiment of a magnet armature construction according to the invention,

designated by the reference numeral 11. Identical parts have been designated by the same numerals as those used in Figs. 1 and 2. In this embodiment, the cavities 8, provided through the opposite bottom surfaces 6 of the seats 5 in the cylindrical body, are connected to each other by an internal duct 12 in the cylindrical body 2. At least both cavities 8 are provided with a screw thread 9, but the internal duct 12 may also be provided with a screw thread or another positively locking geometric formation. Two possible embodiments of the circumferential wall 7 of the seat 5 are shown: a toothing and a combination of a toothing and a circumferential wall 7 tapering towards the head end 4.

[0012] The possible embodiments of the circumferential wall 7 and cavity 8 shown in these figures only serve as an example of the possible anchoring mechanisms for anchoring an elastic sealing element 10 to the cylindrical body 2 in a positively locking manner.

[0013] Possible dimensions for the cylindrical body 2 are a total length of 20-25 mm and a diameter of 6.5-8 mm. The seat 5 may have a diameter of 5-7 mm and is preferably 2-3 mm deep. The cavity 8 may have a diameter of 2-3 mm and is preferably 2-4 mm deep.

[0014] Fig. 4 shows a solenoid valve 20 in a housing 25 with a duct 24. The solenoid valve 20 comprises a coil 21 and a cylinder-shaped shaft 22 for a magnet armature construction 1 within the coil 21. The magnet armature construction 1 is held in place by a spring 23. The magnet armature construction 1 is identical to the construction illustrated in Fig. 1 and therefore identical parts are designated by identical numbers. If sufficient current flows through the coil 21 to overcome the spring force of the spring 23, the magnet armature construction 1, as a result of the force of the magnetic field which has been created, pushes the spring 23 downward as a result of which the valve at the top near the duct 24 is opened.

[0015] Fig. 5 shows a vehicle 30 equipped with an anti-lock braking system 31 provided with a magnet armature construction 1 according to the invention.

Claims

1. Magnet armature construction comprising a ferromagnetic body, preferably a cylindrical body, having a lateral surface and two head ends, in which at least one of the head ends is provided with at least one seat having a bottom surface and a circumferential wall, which seat is designed in such a manner that a positively locking anchoring with a sealing element is achieved by one or more positively locking geometric formations being provided in the circumferential wall of the seat, and an elastomer sealing element which is injection-moulded into the seat, **characterized in that** the positively locking anchoring is also produced by the fact that at least one cavity is provided through the bottom surface of the

seat in the ferromagnetic body, the circumferential wall of which is provided with at least one positively locking geometric formation, in which cavity a part of the elastomer sealing element is injection-moulded.

2. Magnet armature construction according to claim 1, in which the cavity is cylinder-shaped.

3. Magnet armature construction according to one or more of the preceding claims, in which the cavity is positioned centrally in the seat.

4. Magnet armature construction according to one or more of the preceding claims, in which the positively locking geometric formation in the cavity is a screw thread.

5. Magnet armature construction according to claim 4, in which the cavity is provided with a screw thread of between M2 and M4.

6. Magnet armature construction according to one or more of the preceding claims, in which the elastomer sealing element extends above the head end of the ferromagnetic body.

7. Magnet armature construction according to one or more of the preceding claims, in which both opposite head ends of the ferromagnetic body are provided with seats having cavities provided in the ferromagnetic body going through the bottom surface in which the circumferential walls of the cavities are provided with positively locking geometric formations and in which these cavities are connected to one another by an internal duct in the ferromagnetic body.

8. Magnet armature construction according to one or more of the preceding claims, in which the cross section of the cavity, through a plane parallel to the bottom surface of the seat, is not larger than 4 millimetres.

9. Ferromagnetic body, clearly intended for use with a magnet armature construction according to claim 1.

10. Solenoid valve provided with a magnet armature construction according to one or more of the preceding claims.

11. Anti-lock braking system provided with a magnet armature construction according to one or more of the preceding claims.

12. Vehicle with an anti-lock braking system provided with a magnet armature construction according to one or more of the preceding claims.

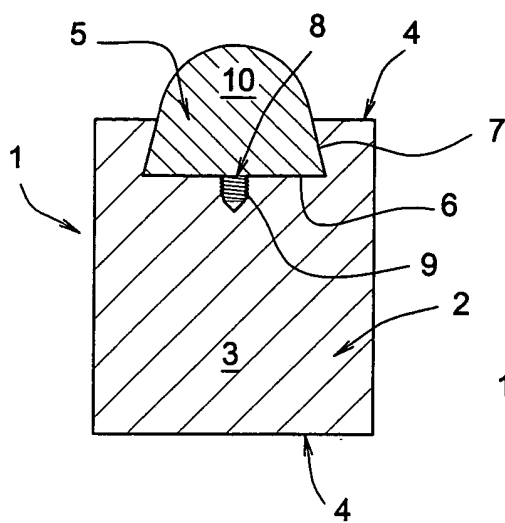


Fig. 1

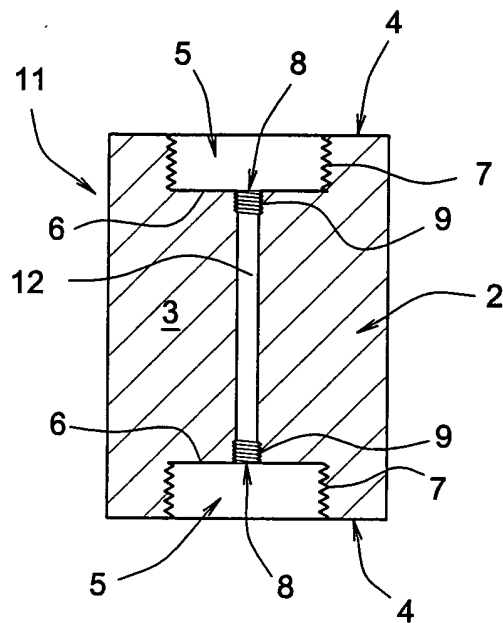


Fig. 3

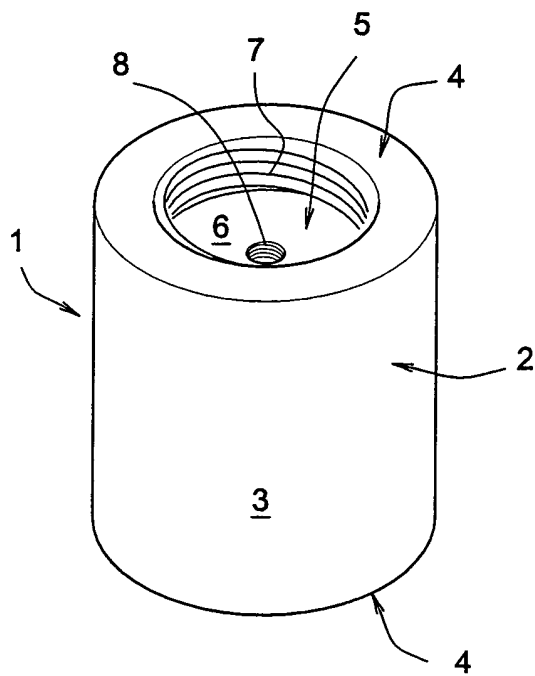


Fig. 2

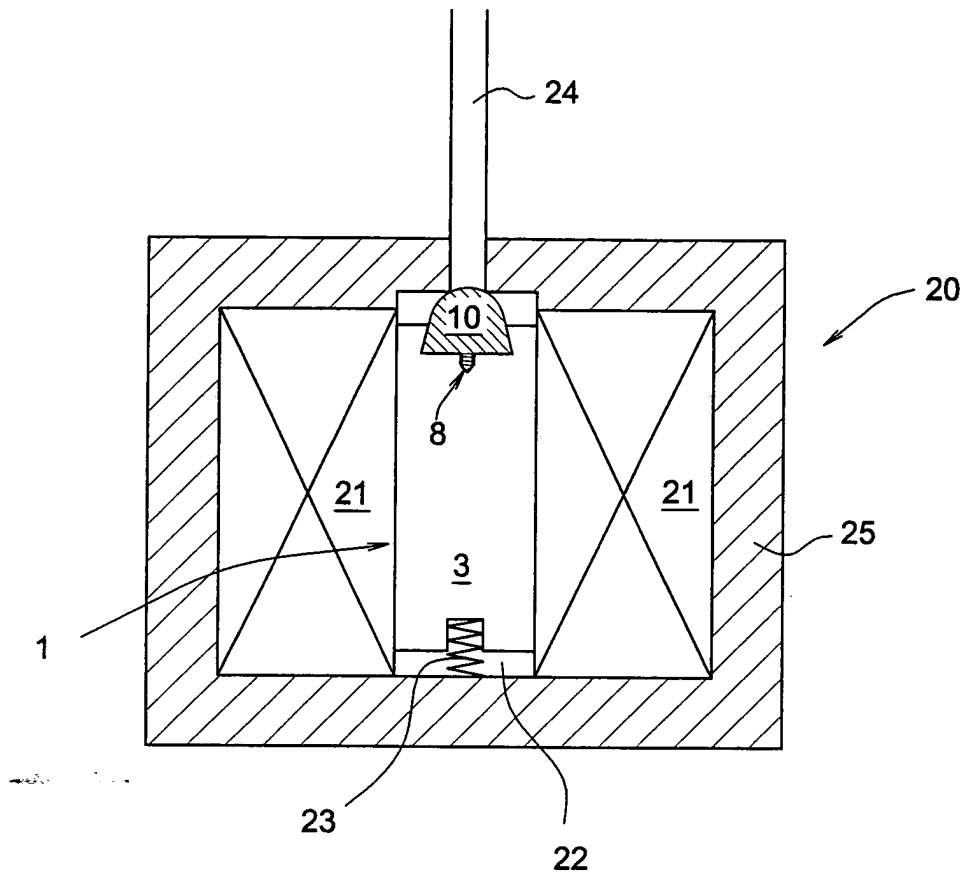


Fig. 4

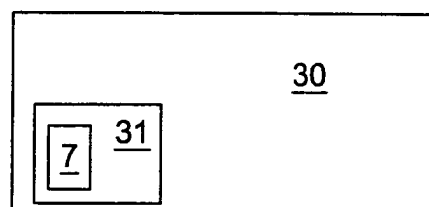


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 05 07 5509

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,A	US 2002/135451 A1 (FRANK DIETER ET AL) 26 September 2002 (2002-09-26) * abstract; figures * -----	1	H01F7/08 H01F7/16 F16K31/06
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01F F16K
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 June 2005	Examiner Marti Almeda, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 07 5509

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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09-06-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002135451 A1	26-09-2002	DE 10113316 A1 EP 1244116 A2	26-09-2002 25-09-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82