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(54) Magnet armature

Magnetanker

Armature d'aimant

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(56) References cited:
US-A1- 2002 135 451

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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-1 244 116.

[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-1 244 116, 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 adhesive 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.

[0008] 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.

[0009] It is noted that fig. 5 of US2002/0135451 A1 (which is a family member of EP-A-1 244 116) shows a magnet armature having seats in its both head ends, which seats are connected to one another by means of an internal duct in the ferromagnetic body. However in this embodiment neither the seats neither the duct are provided with undercuts as positively locking geometric formations. 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.

[0010] In one embodiment according to the present invention, the 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.

[0011] 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.

[0012] 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 cylin-

drical 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.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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 (1) comprising a ferromagnetic body (2), preferably a cylindrical body, having a lateral surface (3) and two head ends (4), in which at least one of the head ends (4) is provided with at least one seat (5) having a bottom surface (6) and a circumferential wall (7), which seat (5) is designed in such a manner that a positively locking anchoring with a sealing element is achieved by one or more first positively locking geometric formations being provided in the circumferential wall (7) of the seat (5), and an elastomer sealing element (10) which is injection-moulded into the seat (5),
characterized,
in that the positively locking anchoring is also produced by the fact that at least one cavity (8) is provided as a recess in the bottom surface (6) of the seat (5) in the ferromagnetic body (2), **in that** the circumferential wall (9) of the cavity (8) is provided with at least one second positively locking geometric formation, **and in that** a part of the elastomer sealing element (10) is injection-moulded in the cavity (8).

2. Magnet armature structure according to claim 1, in which, viewed in the direction of the plane of the bottom surface (6) of the seat (5), the cavity (8) is smaller than the bottom surface (6) of the seat (5).

3. Magnet armature construction according to claim 1 or 2, in which the cavity (8) is cylinder-shaped.

4. Magnet armature construction according to one or more of the preceding claims, in which the cavity (8) is positioned centrally in the seat.

5. Magnet armature construction according to one or more of the preceding claims, in which the second positively locking geometric formation in the cavity (8) is a screw thread (9) or a toothing.

6. Magnet armature construction according to claim 5, in which the cavity (8) is provided with a screw thread (9) of between M2 and M4.

7. Magnet armature construction according to one or more of the preceding claims, in which the elastomer sealing element (10) extends above the head end (4) of the ferromagnetic body (2) .

8. Magnet armature construction according to one or more of the preceding claims, in which both opposite head ends (4) of the ferromagnetic body (2) are provided with a said seat (5) each having a said cavity (8) provided as a recess in the bottom surface of said seat in the ferromagnetic body (2), in which the circumferential walls of both said cavities (8) are provided with said second positively locking geometric formations and in which both cavities (8) are connected to one another by an internal duct (12) through the ferromagnetic body (2) .

9. Magnet armature construction according to one or more of the preceding claims, in which the cross section of the cavity (8), through a plane parallel to the bottom surface (6) of the seat (5), is not larger than 4 millimetres.

10. Solenoid valve (20) provided with a magnet armature construction (1) according to one or more of the pre-

ceding claims 1-9.

11. Anti-lock braking system (31) provided with a magnet armature construction (1) according to one or more of the preceding claims 1-9.

12. Vehicle (30) with an anti-lock braking system (31) provided with a magnet armature construction (1) according to one or more of the preceding claims 1-9.

Patentansprüche

1. Magnetankerkonstruktion (1), die einen ferromagnetischen Körper (2), vorzugsweise einen zylindrischen Körper, umfasst, der eine seitliche Oberfläche (3) und zwei Kopfenden (4) aufweist, bei der mindestens eines der Kopfenden (4) mit mindestens einer Aufnahme (5) versehen ist, die eine Bodenfläche (6) und eine Umfangswand (7) aufweist, wobei die Aufnahme (5) derart ausgestaltet ist, dass durch ein oder mehrere erste(s) formschlüssig verbindende(s) geometrische(s) Gebilde, das/die in der Umfangswand (7) der Aufnahme (5) vorgesehen ist/sind, und ein Elastomer-Dichtungselement (10), das in die Aufnahme (5) hinein spritzgegossen ist, eine formschlüssige Verankerung mit einem Dichtungselement erreicht wird,
dadurch gekennzeichnet,
dass die formschlüssige Verankerung auch dadurch bewirkt wird, dass mindestens ein Hohlraum (8) als eine Aussparung in der Bodenfläche (6) der Aufnahme (5) in dem ferromagnetischen Körper (2) vorgesehen ist, dass die Umfangswand (9) des Hohlraums (8) mit mindestens einem zweiten formschlüssig verbindenden geometrischen Gebilde versehen ist und dass ein Teil des Elastomer-Dichtungselements (10) in dem Hohlraum (8) spritzgegossen ist.

2. Magnetankerkonstruktion nach Anspruch 1, bei der, in der Richtung der Ebene der Bodenfläche (6) der Aufnahme (5) gesehen, der Hohlraum (8) kleiner ist als die Bodenfläche (6) der Aufnahme (5).

3. Magnetankerkonstruktion nach Anspruch 1 oder 2, bei welcher der Hohlraum (8) zylinderförmig ist.

4. Magnetankerkonstruktion nach einem oder mehreren der vorhergehenden Ansprüche, bei welcher der Hohlraum (8) mittig in der Aufnahme angeordnet ist.

5. Magnetankerkonstruktion nach einem oder mehreren der vorhergehenden Ansprüche, bei der das zweite formschlüssig verbindende geometrische Gebilde in dem Hohlraum (8) ein Schraubengewinde (9) oder eine Verzahnung ist.

6. Magnetankerkonstruktion nach Anspruch 5, bei welcher der Hohlraum (8) mit einem Schraubengewinde (9) zwischen M2 und M4 versehen ist.

7. Magnetankerkonstruktion nach einem oder mehreren der vorhergehenden Ansprüche, bei der das Elastomer-Dichtungselement (10) sich oberhalb des Kopfendes (4) des ferromagnetischen Körpers (2) erstreckt.

8. Magnetankerkonstruktion nach einem oder mehreren der vorhergehenden Ansprüche, bei der beide gegenüberliegende Kopfenden (4) des ferromagnetischen Körpers (2) mit einer Aufnahme (5) versehen sind, die jeweils einen Hohlraum (8) aufweist, der als eine Aussparung in der Bodenfläche der Aufnahme in dem ferromagnetischen Körper (2) vorgesehen ist, bei der die Umfangswände beider Hohlräume (8) mit den zweiten formschlüssig verbindenden geometrischen Gebilden versehen sind und bei der beide Hohlräume (8) durch einen innenliegenden Kanal (12) durch den ferromagnetischen Körper (2) hindurch miteinander verbunden sind.

9. Magnetankerkonstruktion nach einem oder mehreren der vorhergehenden Ansprüche, bei welcher der Querschnitt des Hohlraums (8) durch eine Ebene parallel zur Bodenfläche (6) der Aufnahme (5) hindurch nicht größer ist als 4 Millimeter.

10. Magnetventil (20), das mit einer Magnetankerkonstruktion (1) nach einem oder mehreren der vorhergehenden Ansprüche 1-9 versehen ist.

11. Antiblockiersystem (31), das mit einer Magnetankerkonstruktion (1) nach einem oder mehreren der vorhergehenden Ansprüche 1-9 versehen ist.

12. Fahrzeug (30) mit einem Antiblockiersystem (31), das mit einer Magnetankerkonstruktion (1) nach einem oder mehreren der vorhergehenden Ansprüche 1-9 versehen ist.

Revendications

1. Construction d'armature d'aimant (1) comprenant un corps ferromagnétique (2), de préférence un corps cylindrique, ayant une surface latérale (3) et deux extrémités de tête (4), dans laquelle au moins l'une des extrémités de tête (4) est prévue avec au moins un siège (5) ayant une surface inférieure (6) et une paroi circonférentielle (7), lequel siège (5) est conçu de sorte qu'un ancrage à verrouillage positif avec un élément d'étanchéité est obtenu par une ou plusieurs premières formations géométriques de verrouillage positif qui sont prévues dans la paroi circonférentielle (7) du siège (5), et un élément d'étanchéité élastomère (10) qui est moulé par injection dans le siège

(5),
caractérisée en ce que l'ancrage de verrouillage positif est également produit par le fait qu'au moins une cavité (8) est prévue en tant qu'évidement dans la surface inférieure (6) du siège (5) dans le corps ferromagnétique (2), **en ce que** la paroi circonférentielle (9) de la cavité (8) est prévue avec au moins une seconde formation géométrique à verrouillage positif, et **en ce qu'**une partie de l'élément d'étanchéité élastomère (10) est moulé par injection dans la cavité (8).

2. Structure d'armature d'aimant selon la revendication 1, dans laquelle, observée dans la direction du plan de la surface inférieure (6) du siège (5), la cavité (8) est plus petite que la surface inférieure (6) du siège (5).

3. Construction d'armature d'aimant selon la revendication 1 ou 2, dans laquelle la cavité (8) est en forme de cylindre.

4. Construction d'armature d'aimant selon une ou plusieurs des revendications précédentes, dans laquelle la cavité (8) est positionnée au centre dans le siège.

5. Construction d'armature d'aimant selon une ou plusieurs des revendications précédentes, dans laquelle la formation géométrique à verrouillage positif dans la cavité (8) est un filetage de vis (9) ou une denture.

6. Construction d'armature d'aimant selon la revendication 5, dans laquelle la cavité (8) est prévue avec un filetage de vis (9) compris entre M2 et M4.

7. Construction d'armature d'aimant selon une ou plusieurs des revendications précédentes, dans laquelle l'élément d'étanchéité élastomère (10) s'étend au-dessus de l'extrémité de tête (4) du corps ferromagnétique (2).

8. Construction d'armature d'aimant selon une ou plusieurs des revendications précédentes, dans laquelle les deux extrémités de tête (4) opposées du corps ferromagnétique (2) sont prévues avec ledit siège (5), ayant chacune ladite cavité (8) prévue en tant qu'évidement dans la surface inférieure dudit siège dans le corps ferromagnétique (2), dans laquelle les parois circonférentielles de deux desdites cavités (8) sont prévues avec lesdites secondes formations géométriques à verrouillage positif et dans laquelle les deux cavités (8) sont raccordées entre elles par un conduit interne (12) à travers le corps ferromagnétique (2).

9. Construction d'armature d'aimant selon une ou plusieurs des revendications précédentes, dans laquelle la section transversale de la cavité (8), à travers un plan parallèle à la surface inférieure (6) du siège (5), n'est pas supérieure à 4 millimètres.

10. Electrovalve (20) prévue avec une construction d'armature d'aimant (1) selon une ou plusieurs des revendications 1 à 9.

11. Système de freinage antiblocage (31) prévu avec une construction d'armature d'aimant (1) selon une ou plusieurs des revendications 1 à 9.

12. Véhicule (30) avec un système de freinage antiblocage (31) prévu avec une construction d'armature d'aimant (1) selon une ou plusieurs des revendications 1 à 9.

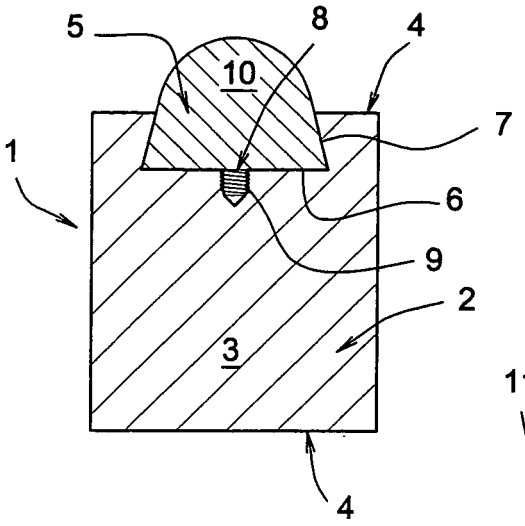

Fig. 1

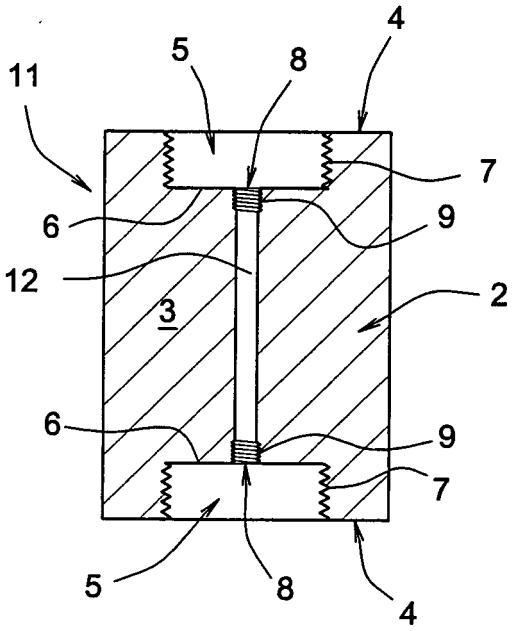

Fig. 3

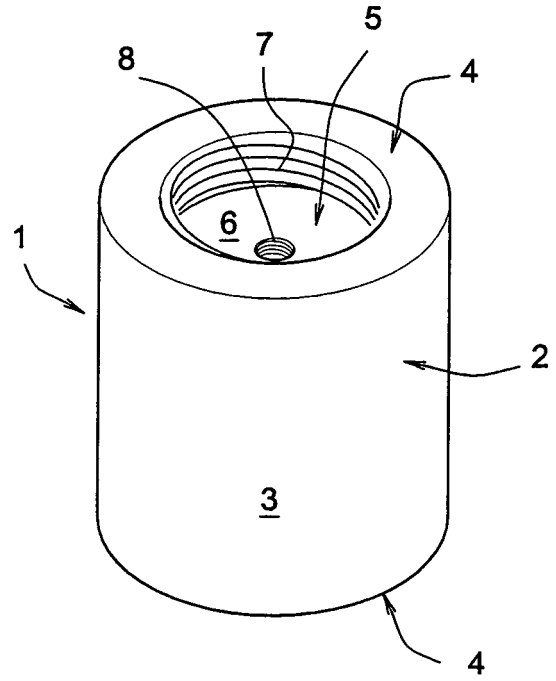

Fig. 2

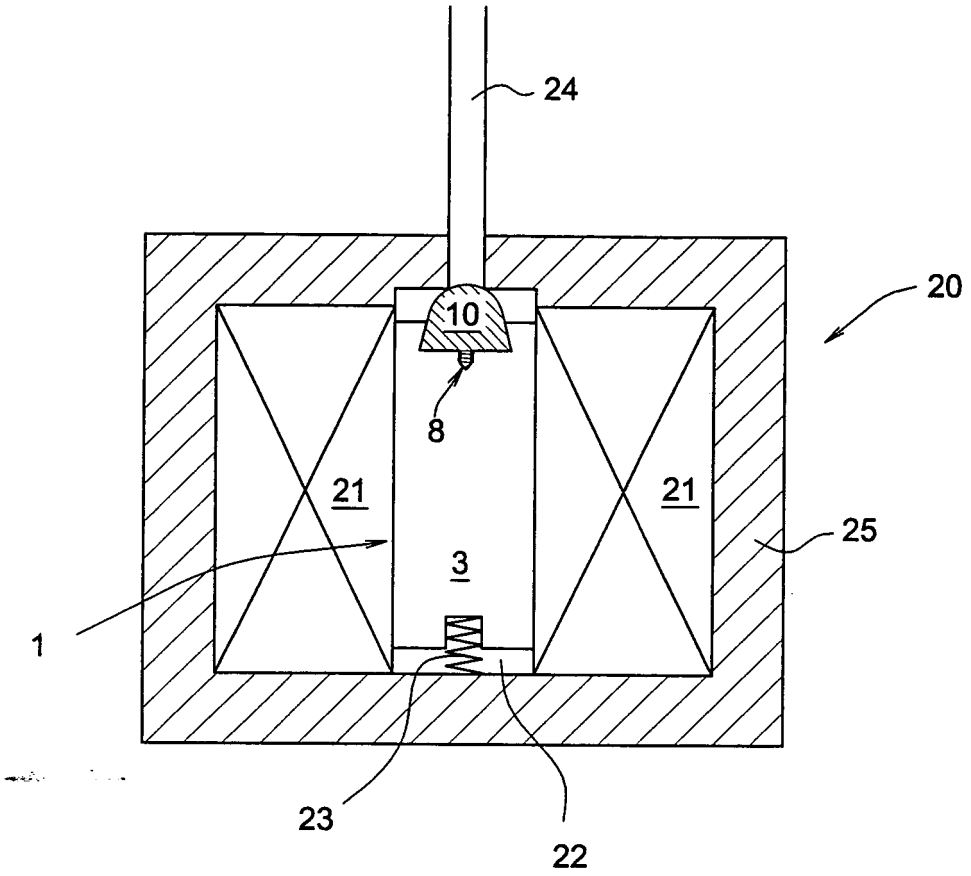

Fig. 4

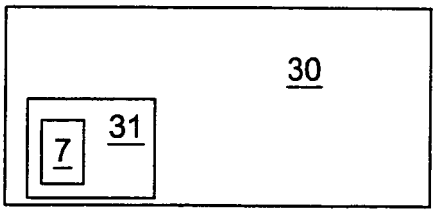

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1244116 A **[0002] [0003] [0009]**
- US 20020135451 A1 **[0009]**