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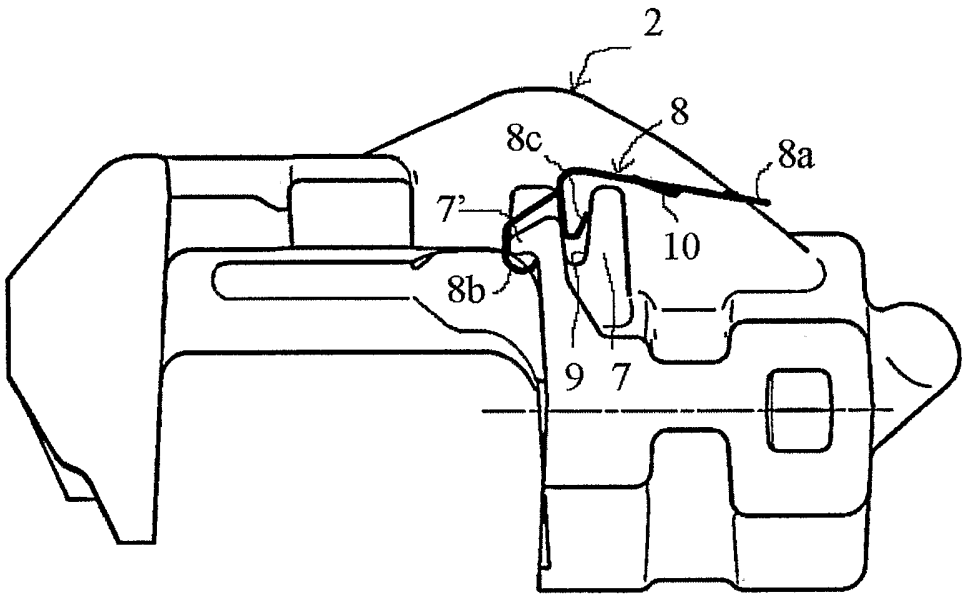
(54) **Title:** SYSTEM FOR FIXING AN ELECTRICAL CONNECTOR TO THE CALLIPER BODY OF A DISK BRAKE



(57) **Abstract:** There is described a system for fixing an electrical connector (6) to the calliper body (2) of a disk brake comprising a wear sensor electrically connected to the electrical connector. To avoid relatively long processing times and therefore high costs, especially operations on the calliper body (2) after it has been moulded, the fixing system comprises means integral with the calliper body that form an insertion-type coupling seating (9), and an elastic foil element (8) comprising a first portion (8a) for fixing the electrical connector (6) and a second portion suitable for being inserted into the seating (9) of the fixing means.

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SYSTEM FOR FIXING AN ELECTRICAL CONNECTOR TO THE CALLIPER BODY OF A DISK BRAKE

DESCRIPTION

[0001] The present invention relates to disk brakes and, more particularly, to a system for fixing an electrical connector to the calliper body of a disk brake as described in the preamble of Claim 1

[0002] It is well known and usual to equip disk brakes, be they of the disk or drum type, with devices capable of detecting the state of wear of the friction gaskets, generally known as wear indicators. The known types of wear indicators differ from each other on account of both the operating principle and their constructional configuration. Disk brakes for vehicles make extensive use of electric wear indicators that utilize a sensor associated with a pad of the brake callipers. These indicators transmit the signal provided by the sensor and indicative of the wear of the pad by means of an electric wire that terminates with a connector, which in its turn is connected by means of a corresponding electric contact element and another electric wire to a display device arranged, for example, on the dashboard of the vehicle.

[0003] To avoid the electric connector and/or the wires that extend therefrom or have to be connected

thereto creating in some way obstruction problems during the assembly of the calliper body, thus rendering it more laborious to mount the latter on the hub-carrier of the vehicle, there has been proposed the solution described in the prior document WO03046403. As indicated in Figure 1, which is identical with a figure of said prior document, the known technique envisages a fixing system comprising a small supporting block 1 integral with the calliper body 2 and traversed by an at least partly threaded through-hole 3, a coupling element 4 and a fixing screw 5. The coupling element 5 is a foil realized in such a manner as to comprise a portion 4a for fixing the electrical connector 6 by means of a snap-type coupling and a holed portion 4b for fixing the foil to the support block 1 by means of a snap insertion and locking it with the fixing screw 5.

[0004] Though this solution fully achieves its purpose, it calls for relatively long processing times and therefore high costs for realizing the parts that constitute the fixing system. In fact, it requires additional processing of the support block 1, obtained in the stamping phase of the calliper body, in order to produce a hole in it and then providing this hole with the necessary thread. Furthermore, the mounting of the coupling element calls for a fixing screw 5.

[0005] The object of the present invention is to make available a fixing system that does not require any processing of the calliper body after its stamping and the use of additional locking elements, such as screws.

[0006] According to the invention, this object is attained by realizing a fixing system as defined and characterized in general terms in Claim 1.

[0007] The invention will be more readily understood from the following detailed description of an embodiment thereof, which is given by way of example and is therefore not to be considered limitative in any way, the description making reference to the attached drawings, of which:

- Figure 1 shows a perspective view with detached parts of an enlarged detail of a calliper body that illustrates the fixing system in accordance with the prior art,

- Figure 2 shows a perspective view of a calliper body for disk brakes that comprises an element of the fixing system in accordance with the invention,

- Figure 3 shows a perspective view with detached parts of a calliper body with a fixing system in accordance with the invention,

- Figure 4 shows a cross section through the calliper body with the fixing system in accordance with the invention, and

- Figures 5 and 6 show two perspective views of another element of the fixing system in accordance with the invention.

[0008] Referring in particular to Figures 2, 3 and 4, the fixing system of this example comprises a raised part 7 and a coupling element 8 in the form of an elastic foil having a first portion for fixing an electrical connector 6 and a second portion for attaching the foil to the calliper body. The raised part is obtained during the moulding phase of the calliper body and is shaped in such a manner as to be provided with two seatings 9 with a V-shaped profile, clearly visible in Figure 2 and partially also in Figure 3, and a tooth 7', which can be seen only in Figure 4. Following its moulding, the calliper body is not subjected to any further processing and for this reason its surface is characterized by a substantial roughness.

[0009] The coupling element 8 is an elastic steel foil that, following operations of shearing and folding, has a small tongue 8a on one side and on the other side is provided with an element in the form of a hook 8b and two small tongues 8c folded into a V. The tongue 8a has

a projecting part 10 at the centre that is sheared and raised with respect to the plane of the tongue. The electrical connector 6 is fixed to the coupling element 8, letting the tongue 8a slide in a corresponding seating, in the present example a rail 11, along one side wall of the connector until the projection 10 comes to engage by means of a snap fit with a corresponding recess - not shown on the drawings - of the wall in question.

[0010] When the connector 6 is to be fixed to the calliper body 2, the coupling element 8 is positioned in such a way as to engage the hook-shaped element 8b with the corresponding tooth 7' and at the same time inserting, albeit without forcing, the two V-shaped tongues 8c in the respective seatings 9. Thereafter a sufficient force is applied to the coupling element to press the two V-shaped tongues 8c into their seatings 9. As a result of this operation, the ends of the two tongues become engaged with the rough surface of the walls of the seatings and, thanks to the elasticity of the material, exercise a considerable pressure on these walls, so that the coupling element 8 remains in position even when the force that acted on it during the insertion phase is no longer applied.

[0011] It should be noted that, once the forced insertion of the two V-shaped tongues 8c has been obtained, the end of the element 8b in the form of a hook tends to move away from the tooth 7'. Nevertheless, this does not compromise the fixing of the coupling element 8, because the pressure fit between the V-shaped tongues and the rough surface of the calliper body is sufficiently firm. For this reason the invention can be put into practice also with a coupling element 8 devoid of the part with the hook. However, the embodiment as here described is advantageous in case there occurs a slackening of the pressure fit. In that case the coupling element, notwithstanding its slackening, will remain in position and in contact with the calliper body thanks to the fact that the hook-shaped element is engaged with the tooth 7'.

[0012] Having obtained the definitive coupling of the foil element and the calliper body, one continues as indicated in the known technique by attaching the electrical connector by means of a snap coupling and completing all the other operations necessary for mounting the disk brake on the vehicle.

[0013] The object of the invention is fully attained inasmuch as the described fixing system does not call for any processing of the calliper body after

moulding and the fixing of the connector to the calliper body is obtained without having to use such additional locking elements as, for example, screws. This thanks to the fact that the engagement of the elastic foil that constitutes the coupling element and the calliper body is assured by the rough surface of the snap-fit coupling seatings.

CLAIMS

1. A system for fixing an electrical connector (6) to the calliper body (2) of a disk brake comprising a wear sensor electrically connected to the electrical connector, characterized in that it comprises

- fixing means formed as a single piece with the calliper body (2), comprising an insertion-type coupling seating (9) and

- an elastic foil element (8) comprising a first portion (8a) for fixing the electrical connector (6) and a second portion (8c) suitable for being inserted in the seating (9) of the fixing means.

2. A fixing system in accordance with Claim 1, wherein the second portion (8c) of the elastic element (8) comprises at least one tongue bent into a V-shape.

3. A fixing system in accordance with Claim 1, wherein the elastic foil element (8) comprises a third portion in the form of a hook (8b) and the fixing means comprise a corresponding hook-on element (7'), the third portion becoming engaged with the corresponding hook-on element when the second portion (8c) is inserted in the seating (9) of the fixing means.

4. A fixing system in accordance with Claim 3, wherein the fixing means are formed as raised parts (7)

of the calliper body that define the insertion-type coupling seating (9) and the hook-on element (7').

5. A fixing system in accordance with any one of the preceding claims, wherein the first portion (8a) of the fixing means of the connector comprises a tongue capable of becoming engaged by means of a snap-type fit in a corresponding connector seating.

6. A disk brake comprising a fixing system in accordance with any one of the preceding claims.

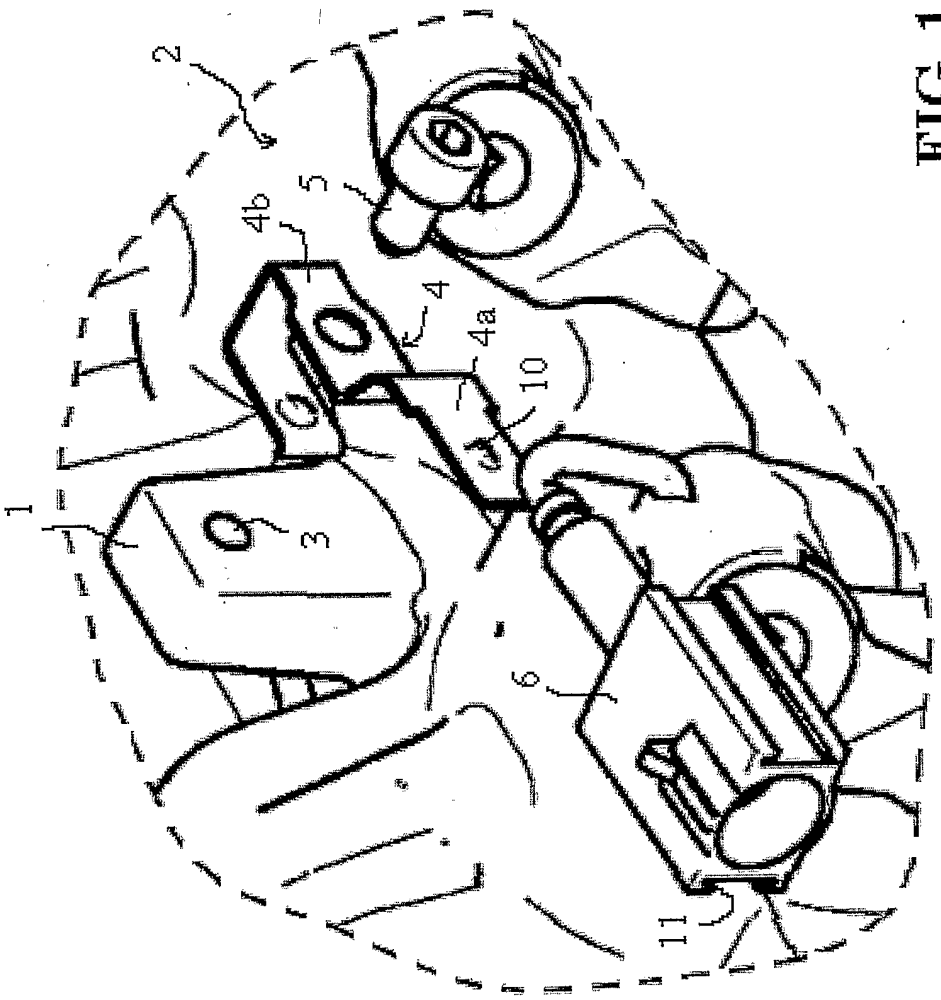

FIG. 1

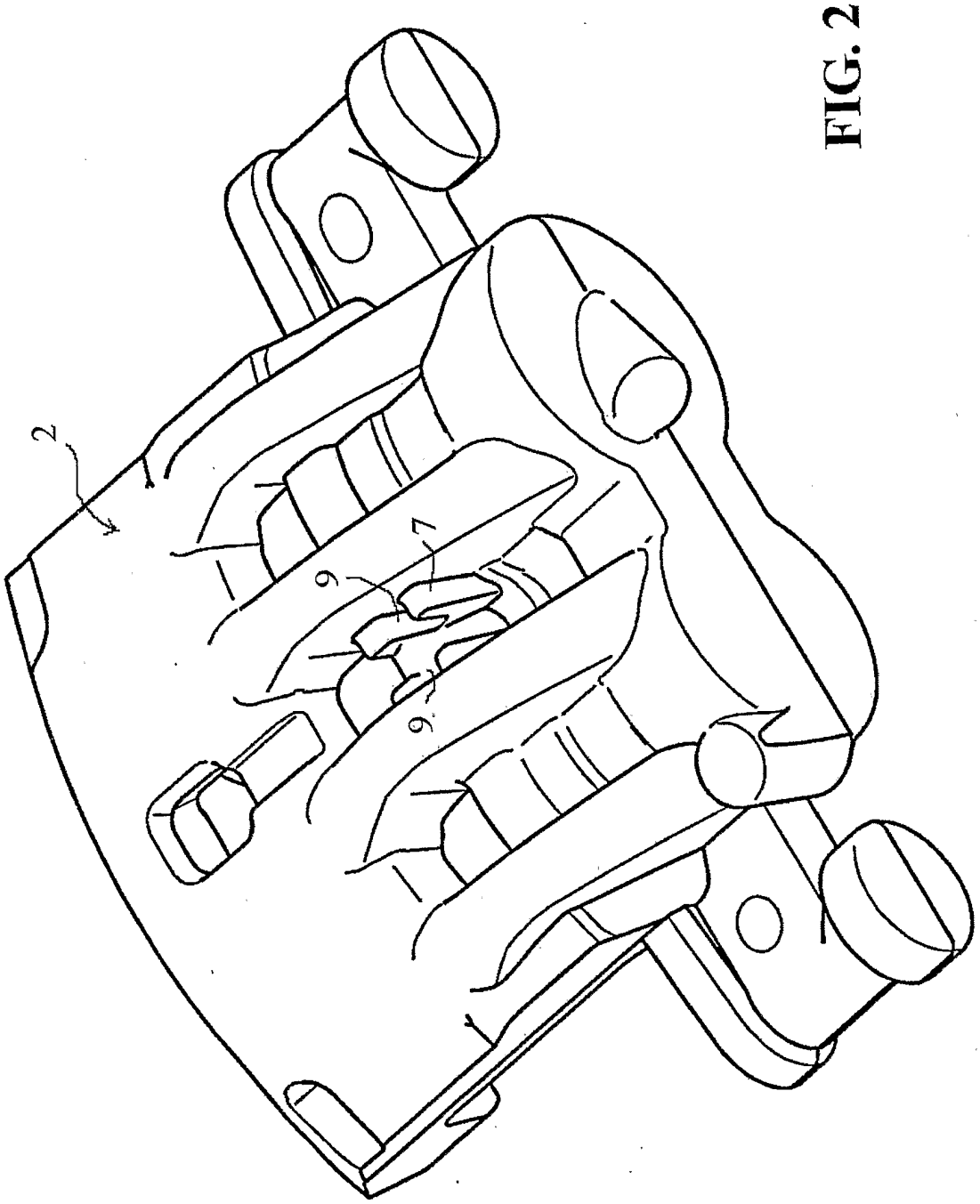

FIG. 2

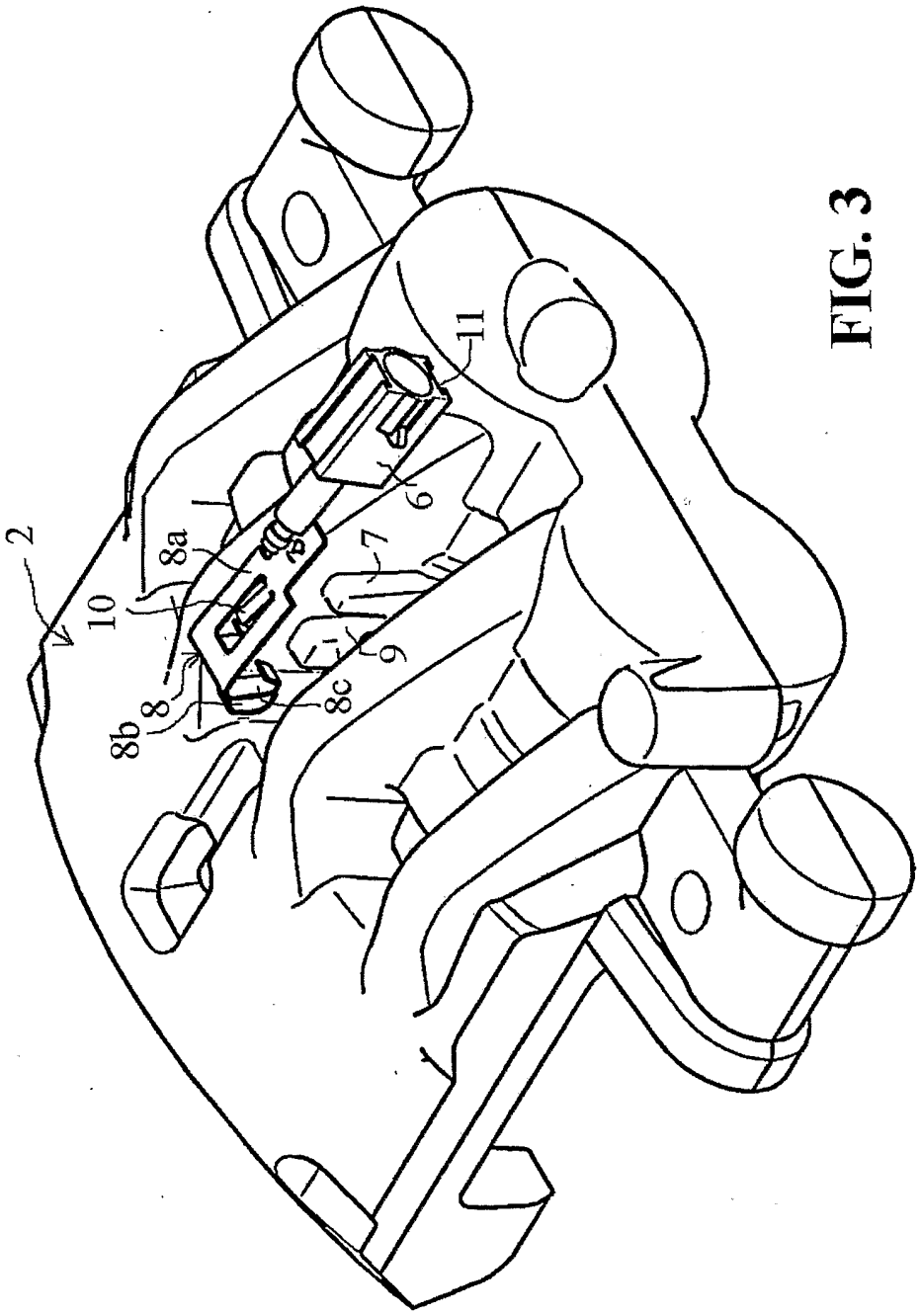

FIG. 3

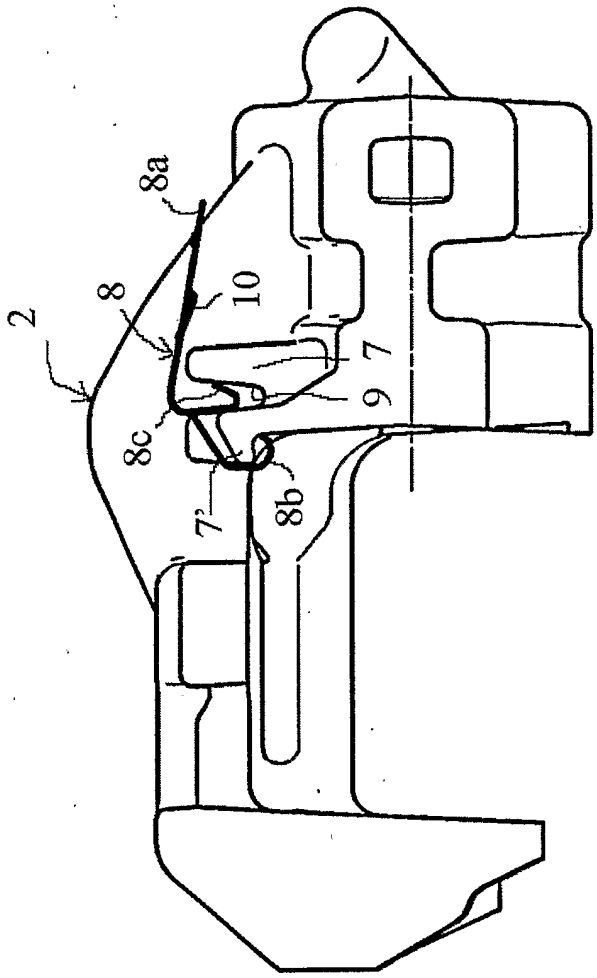

FIG. 4

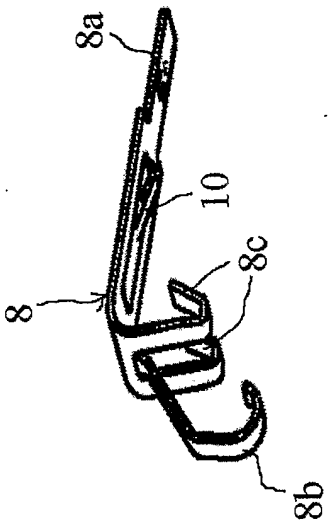

FIG. 6

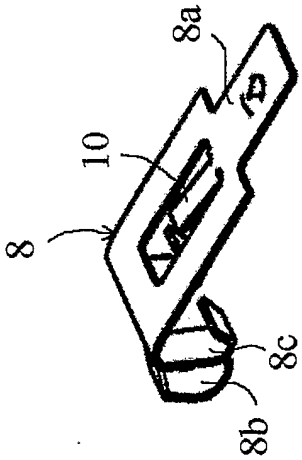

FIG. 5

INTERNATIONAL SEARCH REPORT

Inter al Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16D66/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 183 012 A (KIMURA, RYOICHI) 8 January 1980 (1980-01-08) column 2, line 13 - column 3, line 2; figures 2,4a,4b,4c	1-3,5,6
X	DE 44 31 724 A1 (ITT AUTOMOTIVE EUROPE GMBH, 60488 FRANKFURT, DE; CONTINENTAL TEVES AG) 7 March 1996 (1996-03-07) column 2, line 11 - line 27; figures 1,3	1,2,5,6
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
8 March 2005	16/03/2005

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Interr al Application No
PCT/IT2004/000362

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 03/046403 A (FRENI BREMBO S.P.A; CORTINOVIS, GIANPAOLO) 5 June 2003 (2003-06-05) cited in the application abstract; figure 2	1,6
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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter I Application No
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