

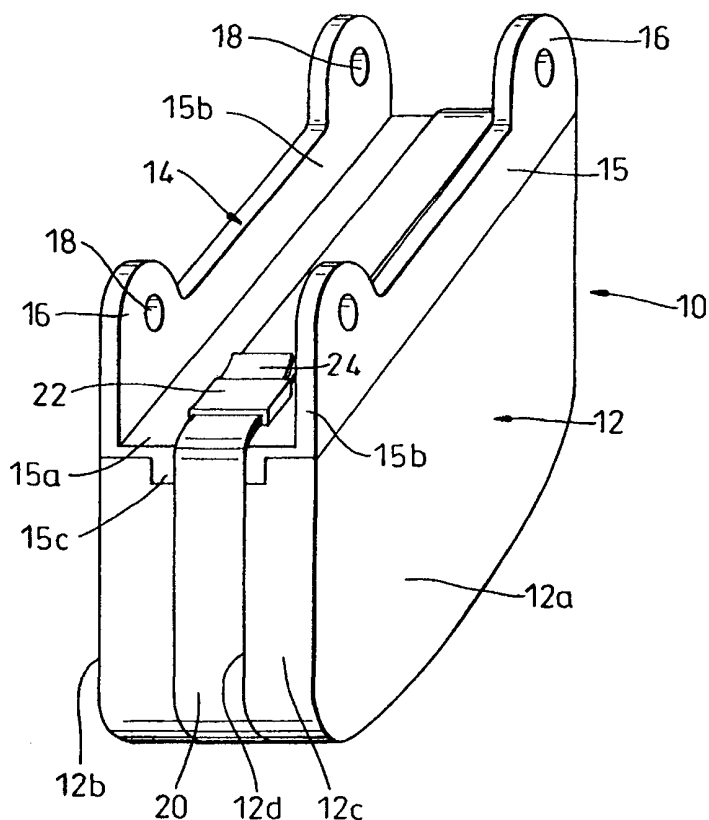
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(21) International Application Number: PCT/GB99/02475 (22) International Filing Date: 28 July 1999 (28.07.99) (30) Priority Data: 9817766.0 15 August 1998 (15.08.98) GB (71) Applicant (for all designated States except US): FEDERAL-MOGUL TECHNOLOGY LIMITED [GB/GB]; Cawston House, Cawston Lane, Rugby, Warwickshire CV22 7SA (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): BUNKER, Gavin [GB/GB]; 22 King Street, Stony Stratford, Milton Keynes, Buckinghamshire MK11 1EE (GB). (74) Agent: DRURY, Peter, Lawrence; T & N Limited, Cawston House, Cawston Lane, Rugby, Warwickshire CV22 7SA (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	

(54) Title: BRAKE PAD ASSEMBLY

(57) Abstract

A brake pad assembly (10) which comprises a block (12) of friction material, and a support (14) on which said block is mounted. The support (14) comprises a rigid portion (15) which provides at least one mounting point (16) by which the assembly (10) can be supported for non-rotational sliding movement. The block (12) is secured in engagement with said rigid portion (15) of the support by a flexible portion (20) of the support which, with the rigid portion (15), encircles at least a portion of said block (12).



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BRAKE PAD ASSEMBLY

This invention is concerned with a brake pad assembly comprising friction material for use in braking vehicles or machinery. The invention applies, for example, to pad assemblies for disc brakes.

In a conventional disc brake, a disc is mounted for rotation with a hub, eg of a vehicle's wheel, and, in order to brake the hub, non-rotatable friction material pads are brought into engagement with oppositely-facing radially-extending surfaces of the disc. In most cases, a disc brake comprises a hydraulic piston and cylinder assembly mounted on a non-rotatable caliper which bridges an edge of the disc, the caliper being slidable relative to the disc in a direction parallel to the axis of the hub. Such a brake also comprises a pad of friction material fixedly mounted on the caliper on the opposite side of the disc to the cylinder, and a pad of friction material which is slidable relative to the caliper. The brake is operated by pressurising the cylinder so that the piston presses the slidable pad against the disc. This action causes the caliper to slide bringing the pad on the opposite side of the disc into engagement with the disc. The disc is now subject to frictional braking forces on both sides of the disc.

In a disc brake, the friction material pads are normally mounted on one side face of a support plate which itself is mounted on the caliper. When the brake is applied, the disc exerts a force on the pads which must be transmitted from the pad to its support plate without causing the pad to become detached from the support plate.

Various techniques are known for improving the adhesion between the pad and its support plate. For example, adhesives may be used and/or holes or recesses may be formed in the support plate into which the friction material of the pad extends. However, these techniques depend on the strength of adhesives or on the shearing strength of the friction material.

It is an object of the present invention to provide an improved brake pad assembly in which mechanical means secures a pad of friction material to a support.

The invention provides a brake pad assembly which comprises a block of friction material, and a support on which said block is mounted, the support comprising a rigid portion which provides at least one mounting point by which the assembly can be supported for non-rotational sliding movement, characterised in that said block is secured in engagement with said rigid portion of the support by a flexible portion of the support which, with the rigid portion, encircles at least a portion of said block.

In a brake pad assembly according to the invention, the friction material block is secured to the support by a strong mechanical connection which does not depend on the shearing strength of the friction material. The flexible portion of the support may be formed, for example, from steel.

An assembly according to the invention is suitable for use in a disc brake system as disclosed in WO 98/25804. This brake system comprises two discs which are slidable on the same hub under the control of leaf springs which act between the hub and the discs. The system also comprises a cylinder which is integrally formed with a suspension link and a caliper also fixed to the suspension link, the caliper having supports for friction pads mounted thereon.

These supports comprise a support for a pad which is moveable by operation of the cylinder, a support for a pad which is fixed on the caliper on the opposite side of the discs from the cylinder, and a support for two pads between the discs which is slidable on the caliper. An assembly according to the invention would replace the support and pads between the discs.

In an assembly according to the invention, said flexible portion of the support may extend in a groove formed in an edge of said block of friction material, thereby reducing the possibility of the block separating from the support.

In order to further reduce the possibility of the block separating from the support, the block may extend into a groove formed in said rigid portion of the support. Alternatively, said rigid portion of the support may comprise at least one projection which extends into said block of friction material.

The flexible portion of said support may extend between two spaced connections with said rigid portion of the support. In this case, at least one of said connections may be releasable to allow replacement of the block. Alternatively, the flexible portion may form a closed loop around said block and said rigid portion of the support.

In order to reduce the possibility of corrosion, the assembly may also comprise sealing material arranged to prevent the entry of water between said support and said block.

Where the assembly is to be used in a disc brake which has multiple discs, eg of the type described in WO 98/25804, said block of friction material has two generally

planar friction-creating surfaces which face in opposite directions so that they can engage discs on either side of the assembly.

There now follows a detailed description, to be read with reference to the accompanying drawings, of a brake pad assembly which is illustrative of the invention.

The drawing is a perspective view of the illustrative assembly.

The illustrative brake pad assembly 10 shown in the drawings comprises a block of friction material 12 which is made from a conventional material held together by a phenolic resin binder. The block 12 has two generally planar friction-creating surfaces 12a and 12b which face in opposite directions. The assembly 10 is intended to be mounted in a disc brake having multiple discs. The surfaces 12a and 12b are positioned so that, when the assembly 10 is mounted between two discs, the surface 12a can engage one of the discs and the surface 12b can engage the other. The surfaces 12a and 12b extend to an edge of the block 12 where they meet a peripheral surface 12c of the block which extends right around the block 12. This peripheral surface 12c has a groove 12d therein which has a generally rectangular cross-section.

The pad assembly 10 also comprises a support 14 on which said block 12 is mounted. The support 14 comprises a rigid portion 15 which provides mounting points 16 by which the assembly 10 can be supported in a disc brake for non-rotational sliding movement towards or away from a disc. By the term "rigid portion" is intended a portion which is not significantly distorted by the forces encountered in braking.

The rigid portion 15 is formed from iron as a generally U-shaped casting having a base 15a and two upstanding side portions 15b. At each end of each of the side portions 15b, an ear 16 projects upwardly to provide a mounting point of the support 14. Specifically, the two ears 16 at one end of the portion 15 have aligned circular holes 18 therein as do the two ears at the other end of the portion 15. The holes 18 are arranged so that they can receive two parallel rods (not shown) which form a slideway of a disc brake. Thus, the assembly 10 can be mounted for non-rotational sliding movement in a direction normal to the side portions 15b. The mounting points 16 may take many other forms, eg they may be provided by hook-shaped projections which fit over a slideway as described in WO 98/25804.

The base 15a of the rigid portion 15 of the support 14 has a projection 15c from its under surface. In the assembly 10, the block 12 of friction material is positioned beside the rigid portion 15 with the projection 15c fitted into the groove 12d in the surface of the block 12. Thus, the rigid portion 15 and the block 12 are interlocked. The block 12 may be in a fully-cured state when it is assembled with the support 14, or may be in an uncured ("green") state for later curing, or may be formed in situ against the support 14 and later cured.

The support 14 also comprises a flexible portion 20 formed by an elongated strip of spring steel of rectangular transverse cross-section. One end of the flexible portion 20 is secured to a ratchet mechanism 22 which is positioned on the upper surface of the base 15a of the rigid portion 15. The flexible portion 20 extends away from the ratchet mechanism 22 across the base 15a and then extends around the block 12 being fitted into the groove 12d. The flexible portion 20 then returns to the ratchet mechanism 22 where its ends are secured together. The block 12 is,

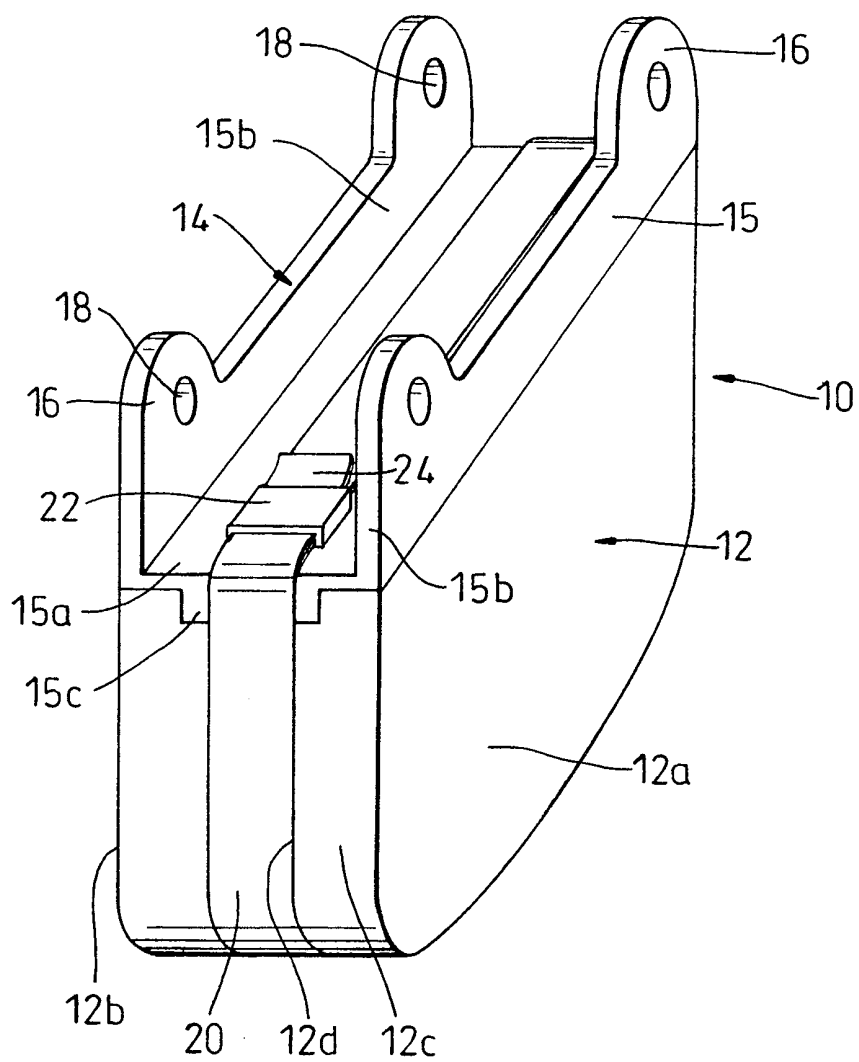
thus, secured in engagement with said rigid portion 15 by the flexible portion 20 which, with the rigid portion, encircles the block 12 and the rigid portion 15 securing them together. The ratchet mechanism is of the type which is well-known for use in joining the ends of steel bands wrapped around packing cases etc. The portion 20 is designed to break at a predetermined tension leaving a short end 24.

CLAIMS

- 1 A brake pad assembly (10) which comprises a block of friction material (12), and a support (14) on which said block is mounted, the support comprising a rigid portion (15) which provides at least one mounting point (16) by which the assembly can be supported for non-rotational sliding movement, characterised in that said block (12) is secured in engagement with said rigid portion (15) of the support (14) by a flexible portion (20) of the support (14) which, with the rigid portion (15), encircles at least a portion of said block (12).
- 2 An assembly according to claim 1, characterised in that said flexible portion (20) of the support (14) extends in a groove (12d) formed in an edge of said block of friction material (12).
- 3 An assembly according to either one of claims 1 and 2, characterised in that said block (12) extends into a groove formed in said rigid portion (15) of the support (14).
- 4 An assembly according to either one of claims 1 and 2, characterised in that said rigid portion (15) of the support (14) comprises at least one projection (15c) which extends into said block of friction material (12).
- 5 An assembly according to any one of claims 1 to 4, characterised in that the flexible portion (20) of said support (14) extends between two spaced connections with said rigid portion (15) of the support.

- 6 An assembly according to claim 5, characterised in that at least one of said connections is releasable.
- 7 An assembly according to any one of claims 1 to 6, characterised in that the assembly (10) also comprises sealing material arranged to prevent the entry of water between said support (14) and said block (12).
- 8 An assembly according to any one of claims 1 to 7, characterised in that said block of friction material (12) has two generally planar friction-creating surfaces (12a, 12b) which face in opposite directions.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/02475

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16D69/04 F16D55/36

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 25804 A (T & N TECHNOLOGY LTD (GB)) 18 June 1998 (1998-06-18) cited in the application abstract; figure 1 page 7, line 10 - line 34 ---	1
A	US 3 194 347 A (HALL, K.J.) 13 July 1965 (1965-07-13) claim 3; figure 5 column 2, line 15 - line 42 ---	1, 2, 8
A	GB 957 285 A (LAMBERT BRAKE CORPORATION) 6 May 1964 (1964-05-06) figures page 2, line 2 - line 40 -----	1, 8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

9 November 1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/02475

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