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D E C I S I O N
of 5 January 1994

Case Number: T 0309/92 - 3.2.1

Application Number: 85106503.7

Publication Number: 0169998

IPC: F16D 65/04

Language of the proceedings: EN

Title of invention:

Disc brake pad

Patentee:

AlliedSignal Inc.

Opponent:

Alfred Teves GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 56, 100(b)

Keyword:

"Disclosure - sufficiency - (yes)"

"Novelty (yes)"

"Inventive step - after amendment - (yes)"

Decisions cited:

-

Catchword:

-

Case Number: T 0309/92 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 5 January 1994

Appellant: Alfred Teves GmbH
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Representative: -

Respondent: AlliedSignal Inc.
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Decision under appeal: Decision of the Opposition Division of the European Patent Office dated 20 February 1992 rejecting the opposition filed against European patent No. 0 169 998 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: F. A. Gumbel
Members: P. Alting van Geusau
B. J. Schachenmann

Summary of Facts and Submissions

- I. European patent No. 0 169 998 was granted with effect from 31 August 1988 on the basis of European patent application No. 85 106 503.7, filed on 28 May 1985.
- II. With Notice of Opposition, filed on 27 May 1989, the Appellant (Opponent) requested revocation of the patent for the reason of non-compliance with the provisions of Article 100(a) EPC. With letter dated 10 April 1991 the Appellant also raised an objection with respect to sufficiency of disclosure of the invention in accordance with Article 100(b) EPC.

In respect of an alleged lack of novelty and inventive step of the subject-matter of the patent the following documents were cited in the opposition proceedings:

- D1: DE-A-2 919 537
D2: ATE-Brake Handbook, 2nd edition 1981, pages 1 and 121,
D3: EP-A-0 061 107
D4: DE-A-2 427 040
D5: DE-A-2 508 720

- III. By decision dated 20 February 1992 the Opposition Division rejected the opposition.

The Opposition Division held that taking into account in particular the test results shown in Figures 2 to 5 of the patent in suit the invention is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

In respect of inventive step the Opposition Division was of the opinion that a combined consideration of D1 and D2 would not lead to the teaching of Claim 1 of the patent and in particular not to the idea of sizing the arcuate length of the brake pads in relation to the position of the nodes of vibration measured at the inner radius of the wear surface of the brake disc. The documents D3 to D5 were not considered to reveal anything more than D1 or D2.

- IV. An appeal was lodged against this decision on 6 April 1992, with payment of the appeal fee on the same day.

The Statement of Grounds of Appeal was filed on 10 April 1992.

- V. In response to communications in which questions in respect of novelty of the subject-matter of the granted claims and clarity of amended claims were raised by the Board, the Respondent filed with letter dated 16 September 1994 new Claims 1 to 3 and amendments to the description of the patent.

The Respondent requested maintenance of the patent on the basis of the new Claims 1 to 3, the granted description including the proposed amendments and the granted Figures 1 to 10.

Current Claim 1 read as follows:

"A disk brake assembly having a caliper member (28) for locating friction pads (42, 44, 60) adjacent a rotor (12), said pads being urged into engagement with said rotor to effect a brake application, each friction pad

having a rubbing surface with a leading edge (64), a trailing edge (68), an inner edge corresponding to an inner radius of a wear surface on said rotor and an outer edge corresponding to an outer radius of said wear surface, said leading and trailing edges having first and second apices (62, 66) respectively located adjacent said inner edge, and the arcuate length of the pad between said first and second apices (62, 66) at said inner radius being substantially equal to or greater than the arcuate length at said outer radius, whereas said engagement of the friction pads with the rotor excites in said rotor various modes of vibration having natural frequencies with amplitudes of vibration that increase from said inner radius to said outer radius, said modes of vibration under certain conditions creating undesirable noise during a brake application, characterised in that each friction pad extends over an angle (A_p) between the said apices (62, 66) which, when measured from the center of the rotor, has one of the following values: 33 degrees; 48.2 degrees; 57 degrees; 63.8 degrees and 85 degrees, and in that the arcuate length of the pad between said apices (62, 66) is different from the arcuate length of the pad between nodes of a mode of vibration measured at said inner radius to reduce the probability of creating noise during braking."

- VI. In support of his request for revocation of the patent the Appellant relied on arguments put forward against the granted Claims. No additional submissions were received with respect to the subject-matter of the amended Claims 1 to 3.

Article 100(b) EPC objection

There can be derived from column 2, lines 40 to 60 that the brake disc vibration is dependent not only on the parameters defined in Claim 1 but also on a number of other parameters, such as the pad pressure and temperature. Since the patent does not contain information as to how the further parameters should be determined the skilled person does not have sufficient information available for carrying out the invention claimed.

Article 100(a) EPC objection

The closest prior art disclosed in D3 relates to a disc brake arrangement comprising the combination of precharacterising features of granted Claim 1. In addition to that, such known brake pad/disc configurations would, at least for some squeal frequencies, fall within the terms defined in granted Claim 1 so that it must be concluded that the subject-matter of this claim lacks novelty. Such lack of novelty also applies to the subject-matter of the dependent Claims 10 to 12.

The brake pad/disc configurations defined in the dependent Claims 2 to 6 concern essentially all possible brake pad angles between 30° and 90°. Such a broad range of protection is not supported by disclosure of the patent.

VII. The Respondent contested the Appellant's views and essentially relied on the following submissions in support of his request for maintenance of the patent in amended form:

Article 100(b) EPC objection

Although the effect of the features disclosed and claimed is of a statistical nature - as is the brake squeal itself - it is not only valid for the tested combination of brake disc and brake pad but is generally applicable. As is disclosed in the patent, the parameter having the highest influence on the noise is the angular extension of the brake pad and this parameter can be designed and measured without the necessity of performing any test.

Article 100(a) EPC objection

The problem addressed by the claimed invention, namely noise reduction during brake application, does not appear to have been considered at all in D3. The present patent, on the other hand, discloses a brake assembly with particular brake pad configurations through which noise is reduced by avoiding synchronisation with the nodes of vibration in the brake rotor.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is admissible.

2. *Amendments*
 - 2.1 Current Claim 1 is based on the granted Claim 1 which corresponds to original Claim 1 and is correctly related in its pre-characterising portion to the combination of features of the brake disc assembly disclosed in the closest prior art EP-A-61 107 (D3)

referred to in column 1, lines 15 to 17 of the description.

When compared to the granted Claim 1, the subject-matter of the current Claim 1 is restricted to particular brake pad angles measured from the centre of the brake rotor to the brake pad apexes. These particular brake pad angles are disclosed in column 4, lines 14 to 18 and column 5, lines 25 to 30 of the description of the patent, respectively on page 5, lines 34 to 37 and page 7, lines 23 to 27 of the originally filed description.

Dependent Claims 2 and 3 are an adapted version of the granted claims 8 and 9, respectively.

The amendments to the description essentially concern adaptations to the now claimed subject-matter, the definition of the object to be solved by the subject-matter of the patent and corrections of some obvious errors.

Therefore no objections in respect of the requirements of Article 123(2) and (3) EPC arise against the documents currently on file.

3. *Disclosure of the invention (Article 100(b) EPC)*

The ground of opposition under Article 100(b) EPC was not contained in the Notice of Opposition. However, the Opposition Division, examined this ground of its own motion. Thus, the Board, acting within the competence of the first instance, will also consider it (Art. 111 EPC).

The subject-matter of the patent is now limited to the disk brake assemblies having pad angles which directly result from tests carried out on such disc brake assemblies.

In accordance with the disclosures of the present patent (see column 1, lines 22 to 49 of the patent as granted) the pad footprint and in particular the arcuate length between the apexes of the leading and trailing edges of the friction pad is an essential parameter for the probability that unwanted squeal is created by the disc brake arrangement.

Although also other parameters, such as the temperature of and changes in the brake surfaces and bulk properties of the friction material and the rotor (see column 2, lines 56 to 60) have an influence, the test results disclosed in the present patent indicate that the parameter having the highest influence on the creation of unwanted squeal noise is the angular extension of the brake pad.

Considering the limited range of disc brake sizes normally used in vehicles comprising disc brakes, in the Board's opinion the skilled person does not encounter undue difficulties in selecting from the now claimed five specific pad angles the ones that would meet the object of the invention i.e. reducing the probability of creating noise during braking.

Therefore, in the Board's judgment, the patent must be considered to disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

4. *Novelty and inventive step*

4.1 Novelty of the subject-matter of Claim 1 of the amended patent can be concluded alone for the reason that none of the cited documents discloses pad angles having the specific values as claimed.

4.2 The closest prior art in relation to the subject-matter of Claim 1 are the brake disc assemblies disclosed in D3 to which the pre-characterising part of Claim 1 relates.

A generally encountered problem with such disc brake assemblies is the occurrence of squeaking noises during a brake application.

The object to be achieved by the present patent is the reduction of the probability of creating such noise during braking.

4.3 In the cited prior art only the documents D4, D5 and GB-A-2 015 667 (D6) cited in the description of the patent (see column 1, line 12) relate to the avoidance of unwanted noise created during braking. This prior art, however, proposes solutions in the form of the introduction of an intermediate layer of a rubber (D4) or plastics (D5) material at the backside of the brake pad or the provision of slots or holes in the disc with unequal spacing in the circumferential direction of the disc (D6).

In contrast hereto the solution in accordance with Claim 1 of the amended patent is based on the recognition that as long as the arcuate length between

the apexes of the leading and trailing edges of the friction pad is different from the arcuate length between nodes of a mode of vibration, undesirable noise is less likely to occur or is reduced to a level acceptable to the human ear (see column 1, lines 43 to 49 of the patent). In the current Claim 1 specific pad angles are given to be selected so as to reduce the probability of creating noise during braking.

Since the solution proposed in Claim 1 is based on a basically different concept than the solutions suggested in the cited prior art and in the absence of any teaching in the prior art, including documents D1 to D3, to the underlying principle and the specific solution claimed, the subject-matter of Claim 1 is considered to involve an inventive step within the meaning of Article 56 EPC.

- 4.4 It is to be noted that the Appellant's arguments addressed only the subject-matter of the claims in their granted version and no submissions as to the obviousness of the subject-matter of the amended claim, relating essentially to the use of specific pad angle values, were received.
- 4.5 Summarising, the Board comes to the conclusion that current Claim 1 as well as its dependent Claims 2 and 3 relating to particular embodiments of the invention in accordance with Rule 29(3) EPC, can form the basis for maintenance of the patent.
- 5. The description and drawings are in agreement with the actual wording and scope of the Claims. Hence these

documents are also suitable for maintenance of the patent in amended form.

Thus taking into account the amendments made by the Respondent, the patent and the invention to which it relates meet the requirements of the EPC and the patent as amended is to be maintained in this form (Art. 102(3) EPC).

Order

For these reasons it is decided that:

1. The contested decision is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of Claims 1 to 3 filed with letter dated 16 September 1994, the description of the patent as granted with the amendments proposed in the letter dated 16 September 1994, together with the drawings as granted.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel