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**Datasheet for the decision  
of 21 September 2023**

**Case Number:** T 1257/20 - 3.2.08

**Application Number:** 10747282.1

**Publication Number:** 2462359

**IPC:** F16D65/12

**Language of the proceedings:** EN

**Title of invention:**  
VENTILATED BRAKE DISC

**Patent Proprietor:**  
BREMBO S.p.A.

**Opponents:**  
Knorr-Bremse  
Systeme für Nutzfahrzeuge GmbH  
SHW Brake Systems GmbH

**Headword:**

**Relevant legal provisions:**  
EPC Art. 123(2), 100(c)

**Keyword:**  
Amendments - added subject-matter (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
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Case Number: T 1257/20 - 3.2.08

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.08**  
**of 21 September 2023**

**Appellant:** SHW Brake Systems GmbH  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 16 March 2020  
rejecting the opposition filed against European  
patent No. 2462359 pursuant to Article 101(2)  
EPC.**

**Composition of the Board:**

**Chairman**            C. Schmidt  
**Members:**            M. Foulger  
                              A. Björklund

## Summary of Facts and Submissions

- I. With the decision dated 16 March 2020 the opposition division rejected the oppositions of opponent 1 (Knorr-Bremse Systeme für Nutzfahrzeuge GmbH) and opponent 2 (Schwäbische Hüttenwerke Automotive GmbH). They found that the grounds of opposition according to Articles 100 (a), (b) and (c) EPC did not prejudice the maintenance of the patent as granted.
- II. Opponent 2 filed an appeal against this decision and requested that the patent be revoked.
- III. The respondent (patent proprietor) requested that the appeal be dismissed, or in the alternative, that the patent be maintained in amended form according to one of the auxiliary requests 1 to 9 filed with the reply to the grounds of appeal dated 12 November 2021.
- IV. The following document is referred to in this decision:
- D1: WO 02/081941 A1
- V. Claim 1 of the patent as granted reads as follows:  
(Feature references added in bold)
- "Brake disc (1) of rotation axis (X-X), comprising  
**(a)** - a support carrier (2), destined to be coupled to a wheel hub of a vehicle,  
**(b)** - a braking band (3), destined to co-operate with a disc brake calliper, comprising two flanges (20, 22) connected by a plurality of connection elements (24) which define ventilation channels (28) for the passage of a flow of cooling air over the braking band (3),

**(c)** - at least one drive element (32) able to connect the support carrier(2) and the braking band (3) to each other so as to transmit the braking forces exchanged by the braking band (3) and the caliper to the hub, **characterised by** the fact that

**(d)** - at least one connection element (24) has a resistant section variable in an axial direction parallel to the rotation axis (X-X), said resistant section being measured in an area essentially parallel to the direction of the air flow inside the ventilation channels (28), **(d2)** wherein said direction of the air flow is essentially a radial direction, perpendicular to the axis (X-X) and incident with it,

**(e)** - the connection element (24) having a median resistant section (48), measured in relation to an area substantially parallel to the direction of the air flow inside the ventilation channels (28) of the braking band (3),

**(f)** - the connection element (24) having a connection resistant section (60,62) on an inner lateral face (70,72) of a respective flange (20,22), said connection resistant section (60,62) being measured in relation to an area essentially parallel to the direction of the air flow inside the ventilation channels (28) of the braking band (3),

**(g)** - the resistant section of the connection element (24) progressively increasing as it moves from the median resistant section (48) towards the respective connection resistant sections (60, 62),

**(h)** wherein the connection elements (24) have a minimum cross-section at the median resistant section (48) and

**(h2)** are symmetrical in relation to the centre line plane (52) of the brake disc (1),

wherein

**(i)** the flanges (20,22) comprise three rows (36) of connection elements (24), respectively a radially

external row (36') next to an outer radial rim ( $C_e$ ) of the flanges (20,22), a radially internal row (36'') next to an inner radial rim ( $C_i$ ) of the flanges (20,22), a radially intermediate row (36'') radially positioned between said radially external and internal rows (36',36''), said rows (36) angularly brushing the entire circumference of the flanges (20,22)."

Auxiliary request 1 has the following feature added to claim 1 as granted:

"wherein the connection elements (24) comprise at least one extension (92) which extends radially at an inner or outer radial extremity (40,44) of the connection elements (24), said extension (92) increasing the resistant section of the connection element (24), wherein said extension (92) extends axially from at least one inner lateral face (70, 72) of a flange (20, 22) as far as the median resistant section (48) of the connection element (24) so as to radially reduce the resistant section of the connection element (24) moving from the inner lateral face (70, 72) towards the centreline (52) of the brake disc (1), wherein, at the connection resistant section (60, 62), the connection element (24) comprises a perimetral attachment section (88) to the respective flange (20, 22), said perimetral section (88) constitutes a further and separate increase of the resistant section of the connection elements (24), localized on the attachment sections to the flanges (20, 22), wherein the radially external row (36') comprises first and second connection elements (24',24''), the first connection elements (24') having a main radial extension and the second connection elements (24'') having a lesser radial extension or half the radial extension of the first connection elements (24'), wherein the first connection elements (24') comprise extensions (92) at the inner radial

extremities (44)."

Auxiliary request 2

Claim 1 is identical to claim 1 of auxiliary request 1. Dependent claim 3 has been deleted and the remaining claims renumbered.

Auxiliary request 3 has the following feature added to claim 1 of auxiliary request 1:

"wherein the radially internal row (36'') comprises groups of three or four inner connection elements (24,100) angularly positioned between two consecutive drive elements (32), the two inner connection elements (24, 100) adjacent to said consecutive drive elements (32) being fitted with radial extensions (92) on the respective outer radial extremities (40)."

Auxiliary request 4 has the following feature added to claim 1 of auxiliary request 3:

"wherein the inner connection elements (24,100) not facing the consecutive drive elements (32) are angularly aligned with the first connection elements (24') of the radially external row (36')."

Auxiliary request 5 has the following feature added to claim 1 of auxiliary request 4:

"wherein the radially intermediate row (36'') comprises intermediate connection elements (24, 96) fitted with radial extensions (92) at the inner radial extremities (44), said intermediate connection elements (24,96) being angularly aligned with the second connection elements (24') of the radially external row (36')"

Auxiliary request 6 has the following feature added to claim 1 of auxiliary request 5:

"wherein the resistant section of the connection elements (24) has a central section with a constant median resistant section, said resistant section progressively increasing as it moves towards the respective connection resistant sections (60,62)."

Auxiliary request 7 has the following feature added to claim 1 of auxiliary request 6:

"wherein the resistant section of the connection element (24) has a maximum tangential thickness (80) at the radial centreline (84) of the element itself (24), the tangential thickness (80) being measured in a tangential direction perpendicular to the axial direction and radial direction."

Auxiliary request 8 has the following feature added to claim 1 of auxiliary request 7:

"wherein said drive elements (32) comprise a drive body (112) which extends from a bottom (116) to a protrusion (120), the bottom (116) being connected to the braking band (3) and the protrusion (120) being at least partially inserted in a special seat (8) of the carrier (2), the bottom (116) having a "Y" configuration with a pair of branches (124), each branch (124) being connected to a relative flange (20,22) of the braking band (3)."

Auxiliary request 9 has the following feature added to claim 1 of auxiliary request 8:

"wherein:

- the radial intermediate row (36") comprises in turn a first, second and third inner row (104,106,108) staggered angularly, wherein the first inner row (104)

and the third inner row (108) are angularly aligned with the second connection elements (24") of the external row (36') while the second inner row (106) is angularly aligned with the first connection elements (24') of the external row (36'), and - said inner connection elements (24,100) adjacent to the consecutive drive elements (32) are angularly aligned with the second connection elements (24") of the radially external row (36')."

VI. The respondent argued essentially the following:

The feature d2 had been added to claim 1 during examination proceedings. This feature was disclosed in the application as originally filed because even though the exact wording of the claim was not literally disclosed, in the light of the original disclosure, in particular Fig. 4 and paragraph [0046], the skilled person would understand that the direction of flow would be substantially in the radial direction. The respondent referred to Figs. 12 and 13 of D1 to illustrate this.

Hence, the subject-matter of claim 1 of the patent did not go beyond that of the application as originally filed.

VII. The appellant argued essentially the following:

The wording of feature d2, added in examination proceedings, was not explicitly disclosed in the application as filed. The skilled person would not recognise that the air flow was substantially in the radial direction as claimed.

Moreover, Fig.11 of the application showed a connecting

element (indicated with reference sign 24") with a circular cross-section around which the air flow was unlikely to be radial.

Furthermore, Figures 12 and 13 of D1 showed that the air flow deviates from "substantially radial".

Thus, the subject-matter of claim 1 of the patent extended beyond that of the application as originally filed.

### **Reasons for the Decision**

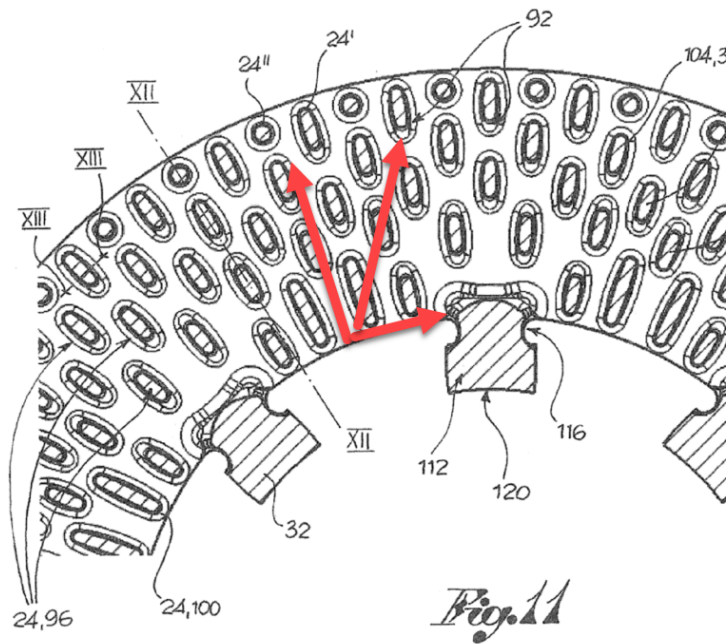
1. Main request - added subject-matter (Article 123(2) EPC)

During examination proceedings, the feature d2 was added to independent claim 1. It is not disputed that this feature was not literally disclosed as such in the application as originally filed.

The respondent argued that this feature was however implicit in the disclosure of the originally filed application because the connection elements had "a mainly radial extension" (application, paragraph [0046]). As the air flow followed the connection elements, the air flow was clearly radial. Also because the coordinate system used was in relation to the brake disc itself (paragraph [0032]), it did not matter that the disc was rotating. Although there were gaps between the connecting elements in the disclosed brake disc, only a small proportion of the air flow passed through these gaps. In support of this the respondent referred to Figs. 12 and 13 of D1.

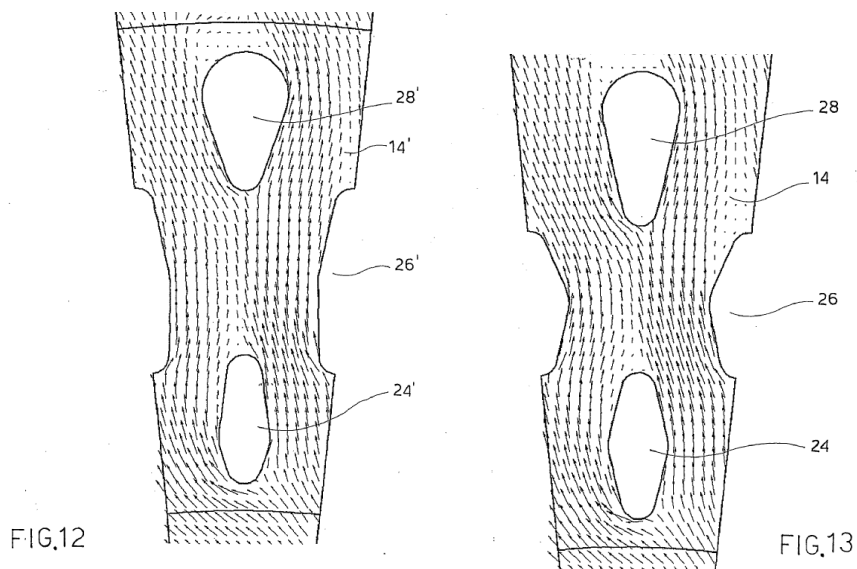
The Board did not find this convincing.

In use, the brake disc rotates, this will impart a tangential and radial force on the air. The "direction of air flow" will be the addition of these two vectors. (see sketch below).



Thus, the mere fact that there is a tangential vector means that the direction will not be incident with the axis and that the direction of air flow will not be "essentially radial".

Also Figs. 12 and 13 of D1, reproduced partially below, do show that there is an air flow (indicated by the arrows) through the gaps between the connecting elements.



These arrows indicate that there is a substantial circumferential component in the direction of air flow due to the rotation of the brake disc which consequently cannot be regarded as substantially radial. Hence, the skilled person would not consider the air flow to be substantially radial.

Furthermore, Fig. 11 of the application shows an embodiment with a connecting element which has a circular cross section (shown with reference sign 24" in the figure). The Board considers that a substantially radial air flow is not disclosed around such a connecting element because inevitably some air will flow around the circumference of this connecting element. Such a "substantially radial" air flow is therefore also not implicit for the skilled person.

Thus, the feature d2 whereby the "direction of the air flow is essentially a radial direction" was not disclosed in the application as originally filed and the ground of opposition under Article 100(c) EPC

prejudices the maintenance of the patent.

2. Auxiliary requests

It was not disputed that the claims of all auxiliary requests also contain the feature d2 discussed above. Therefore their subject-matter also extends beyond that of the application as originally filed.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



C. Moser

C. Schmidt

Decision electronically authenticated