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D E C I S I O N
of 6 December 1999

Case Number: T 0234/98 - 3.2.1

Application Number: 92103497.1

Publication Number: 0508090

IPC: B60C 11/04

Language of the proceedings: EN

Title of invention:
Pneumatic tire having a unique footprint

Patentee:
The Goodyear Tire & Rubber Company

Opponent:
Bridgestone Corporation
SP Tyres UK Limited
Continental AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0234/98 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 6 December 1999

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 15 January 1998 revoking European patent No. 0 508 090 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: F. A. Gumbel
Members: S. Crane
J. H. P. Willems

Summary of Facts and Submissions

I. European patent No. 0 508 090 was granted on 9 August 1995 on the basis of European patent application No. 92 103 497.1.

II. The granted patent was opposed by the present respondents (opponents 01 to 03) on the ground, in particular, that its subject-matter lacked inventive step (Article 100(a) EPC).

Of the extensive prior art relied upon in the opposition proceedings only the following pre-published documents have played any significant role on appeal:

(D1) US-A-4 700 762

(D4) "Testing and Analysis of Tire Hydroplaning", R. W. Yeager and J. L. Tuttle, Goodyear Tire and Rubber Co., 1972

(D13) DE-B-0 636 593

(D14) GB-A-2 193 933

(D20) EP-A-0 391 300

(D25) Linköping Studies in Science and Technology. Dissertations. No. 166, page 75, 1987

(D26) VDI Berichte 778, Chapter 5.3 "Reifenaufstandsflächen", 1989.

III. With its decision posted on 15 January 1998 the Opposition Division revoked the patent.

IV. An appeal against this decision was filed on 26 February 1998 and the fee for appeal paid at the same time. The statement of grounds of appeal was filed on 20 May 1998.

V. Oral proceedings before the Board were held on 6 December 1999.

Opponents 02, who had already indicated their intention in this respect in a letter dated 23 July 1999, did not attend. In accordance with Rule 71(2) EPC the oral proceedings were continued without them.

At the oral proceedings the appellants (proprietors of the patent) presented a single new claim on the basis of which they requested maintenance of the patent in amended form.

This claim reads as follows:

"A pneumatic radial passenger car tire (10), having an aspect ratio of 0.35 to 0.8 and a tread (11) divided into distinct parts (lla, llb) by an aqua channel (12), said tire further having lateral grooves (14) extending from the aqua channel (12) to a shoulder (20) and a footprint at zero speed and under design load and pressure, comprising first and second distinct contact patches corresponding to the tread parts (lla, llb), the contact patches being separated by a void area corresponding to the aqua channel (12) that comprises 10% to 20% of footprint width, the footprint

width being determined by measuring the distance from an outside edge of the first contact patch to the furthest outside edge of the second contact patch, the net-to-gross in the overall footprint being 50% to 70%, and the net-to-gross in each contact patch being 60% to 80%; said tire being characterized in that the two contact patches are trapezoidally shaped and are oriented longer base-to-longer base; and in that the lateral grooves (14), respectively, comprise an initial portion (14a) adjacent the aqua channel (12), and the curvature of the lateral grooves is such that the initial portion (14a) of a lateral groove is in the leading edge of the footprint initiating the flow of water before the rest of the lateral groove enters the footprint, so that the flow of water into, through, and out of the lateral grooves (14), and out of the footprint, is facilitated."

The respondents requested that the appeal be dismissed.

VI. The arguments brought forward by the appellants in support of their request can be summarised as follows:

The aim of the invention was to provide a passenger car tire which combined excellent wet traction properties (ie reduced tendency to hydroplaning) with low noise and low wear. The remarkable commercial success of the tires produced according to the invention clearly demonstrated that this aim had in fact been achieved. Document D1, on which the preamble of claim 1 was based, was on the other hand concerned with an ultra low profile tire with a reduced tread gauge which would make it unacceptable for normal use and which had never been produced in commercial quantities. It was true

that the tread pattern shown in document D1 corresponded essentially to that used in the invention, as was properly recognised by the division of the features between the two parts of the claim, but there the similarity ended; in use the tire of document D1 functioned entirely differently. The reason for this lay in the fact that the interaction between the tire and surface water was dependent on a combination of the tread pattern and the footprint of the tire. As claimed the double trapezoidal footprint shape meant that the initial portion of a lateral groove adjacent the aqua channel was in the leading edge of the footprint, whereby the flow of water outwardly from the aqua channel to the shoulder of the tire was facilitated. From a close reading of document D1 it could be seen however that the footprint there was intended to be butterfly-shaped with the result that an intermediate portion of the lateral groove was in the leading edge of the footprint and consequently water was pumped into rather than away from the aqua channel. This was consistent with the prevailing belief up until the time the invention was made that where an aqua channel was provided it should be used to its full capacity.

There was nothing in the state of the art which could have led the skilled person to adopt the footprint shape defined in the characterising clause of the claim in combination with the tread pattern disclosed in document D1. Only document D14 was concerned with a tire having an aqua channel in the sense of the preamble of the claim and there it was stated that the two contact patches were "oval-shaped to D-shaped". An oval shaped contact patch was clearly different to the trapezoidal shape required by the claim and a D-shaped

patch could only be argued to have even a remote similarity to the claimed shaped if the straight side of the "D" extended along the aqua channel, but there was no indication of this in document D14 and having regard to general considerations was improbable.

None of the other documents particularly relied on showed a tire having an aqua channel of the required form. All that could at best be derived from these documents was that with a tire having no aqua channel an overall oval-shaped footprint was preferable for improved wet traction properties. The application of this concept to a tire having an aqua channel merely led to what was taught by document D14, namely giving each individual contact patch an oval shape.

VII. In reply the respondents argued substantially as follows:

The requirement of the claim that each contact patch had to have a "trapezoidal" shape had to be seen in the context of the patent specification where it was stated that the footprint overall had a conventional oval shape. It was clear from this that the term "trapezoidal" was not intended to be interpreted in an exact sense. Viewed in this light it was apparent that the claimed invention was no more than the combination of the tread pattern disclosed in document D1 with the conventional footprint shape found in any well made modern passenger car tire, as witnessed for example by documents D4, D20, D25 and D26. There was no objective basis whatsoever for the contention of the appellants that the person skilled in the art would understand the tread pattern of document D1 as being combined with a

butterfly-shaped footprint. It could be clearly seen from a comparison with document D13 that the pattern of lateral grooves of document D1 was intended to pump surface water away from the aqua channel. To use a footprint which obviated this effect would therefore be completely illogical.

Reasons for the Decision

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

2. *Technological background; closest state of the art*

Hydroplaning is a well known and hazardous phenomenon which occurs when a tire at elevated speed is no longer capable of clearing surface water from the road. This leads to a build-up of hydrodynamic pressure under the tire footprint with subsequent reduction and ultimately complete loss of traction and/or directional control. In view of its nature it is not surprising that it is a phenomenon which has been the subject of extensive research.

One proposal to reduce the tendency of a radial passenger car tire to hydroplane is to be found in document D1. This document is particularly concerned with ultra low aspect ratio tires having an aspect ratio of no more than 0.60, with the illustrated embodiment having as aspect ratio of 0.58. As explained in the introductory description of the document, such a low profile tire has very good high speed handling

characteristics on dry surfaces but is prone to hydroplaning because of its flatter and wider tread. It is also explained here that a reduction of the tread gauge of a tire in order to lower its rolling resistance will also negatively effect its hydroplaning characteristics. The aim of document D1 is therefore to provide a high speed, low aspect ratio, passenger tire, with a reduced tread gauge, having good wet traction and hydroplaning characteristics.

What document D1 teaches to achieve this end is to provide a depression (ie an "aqua channel" in the terms of the present patent) in the centre of the tread, thus effectively dividing the tread into two distinct parts and accordingly the footprint into two distinct contact patches. The aqua channel has a width equal to at least 10% of the footprint width; in the preferred embodiment it is 11%. The net-to-gross (ie the ratio of the ground contacting surface of a tread to the total tread area) of the individual contact patches is not discussed in the document but for the footprint as a whole this is given as being from 50 to 65%, so taking account of the area occupied by the aqua channel the net-to-gross of each contact patch will be correspondingly higher. A plurality of curved lateral grooves extend from both sides of the aqua channel to the tread edge or shoulder of the tire, with the lateral grooves on both sides of the aqua channel extending in the same direction; the tire is thus designed to be operated in a single direction for normal forward travel. The grooves have a width such that when in the footprint of the tire they do not close up and "provide water channelling passages from the centre of the tread to the tread edge" of the tire (column 2, lines 30 to 34).

It is common ground between the parties that document D1 represents the closest state of the art and accordingly forms the basis for the preamble of the present claim.

3. *The claimed invention*

Although the appellants cannot dispute that the tread pattern disclosed in document D1 corresponds to that taught in the present patent, their strenuously argued standpoint is that the way that tread pattern will function in practice will depend on the shape of the tire footprint and that, in particular, the excellent wet handling characteristics of the tire according to the claimed invention are a result of the combination of the tread pattern with trapezoidally shaped contact patches, arranged with their longer bases along the aqua channel, as defined in the characterising clause of the claim. More specifically, they contend that it is the defined trapezoidal shape of each contact patch which ensures that it is the initial portion of the lateral groove adjacent the aqua channel which first enters the footprint, thus facilitating flow of water outwardly of the footprint. The respondents disputed the appropriateness of the functional statement to this effect as a characterising feature of the claimed invention since in their view outward flow of water through the lateral grooves was at least implicit in the teachings of document D1. However, since it is apparent that document D1 does not specifically disclose a combination of the tread pattern taught there with a footprint or contact patch shape which would ensure the entry of the initial portion of the lateral grooves into the leading edge of the footprint,

the Board can accept the division of the features between the preamble and the characterising clause as being formally correct.

Another area of dispute between the parties concerning the wording of the claim is the ambit of the term "trapezoidal" as applied to the shape of the contact patches. In this respect the appellants concede that this term is not generally known in the context of the shape of tire footprints. Furthermore, having regard to the inherent nature of the product involved they concede that the requirement of the claim that each contact patch is "trapezoidally shaped" is not intended to limit that shape to the geometric form of a trapezium - ie having four straight sides, only two of which are parallel - but is instead intended to include within its ambit shapes of contact patch where at least the leading and trailing edges exhibit some curvature with rounded junctions to the inner and outer edges of the contact patch. However, as explained in their letter of 5 November 1999, they see a significant difference to a "D-"shape of contact patch in that with the trapezoidal shape there is an inclination of the leading edge from the aqua channel to the shoulder of the tire, thus pushing water away from the footprint. That interpretation certainly seems consistent with the exemplified form of footprint shown in Figure 5 of the patent specification. On the other hand, the patent specification itself makes it clear that the angle of inclination can be quite small so that contact patches which "approach the shape of a rectangle may also be desirable", see page 5, lines 13 to 15. Furthermore, in the same letter mentioned above the appellants have included a footprint of an allegedly infringing tire

and explained how there the contact patches are to be seen as being "trapezoidal" within the meaning of the contested patent; to the unbiassed eye, however, it would seem that "D"-shaped would be at least equally appropriate description of their shape. Lastly, the respondents rely on the passage at lines 5 and 6 of page 5 of the patent specification, where it is stated that the footprint of Figure 5 "shows an overall oval shape which is typical of most well made passenger tires", as casting real doubt on what limitation on the shape of the contact patches is imposed by the requirement that they be trapezoidal. To the benefit of the appellants it should however be noted that this passage refers to the footprint as a whole, ie comprising the two contact patches and the aqua channel, and that this footprint, at least in general terms, could be considered as being oval.

Despite the above reservations the Board is prepared to accept, for the purpose of evaluating inventive step, the interpretation of the term "trapezoidally shaped" as advanced by the appellants since it is the one which takes best account of the actual sense of the language chosen when applied to the technology involved and is fully consistent at least with the preferred embodiment disclosed.

4. *Inventive step*

According to the patent specification the object of the invention is to provide a tire having "improved wet traction while having good handling, improved noise and improved irregular wear characteristics", see page 2, lines 21 and 22. At the oral proceedings before the

Board the appellants again emphasised the achievement of this combination of characteristics as being the technical problem underlying the claimed invention. It must be noted however that the patent specification only directs itself in any detail to the question of how the claimed combination of footprint shape and tread pattern improve handling on wet surfaces. Irregular wear is indeed mentioned on page 4, lines 28 to 34, but only in relation to a special design feature of the tread pattern not figuring in the claim. There is therefore no objective basis for associating the claimed tire structure with any improvement in noise or irregular wear characteristics and insofar as it can be assumed that these characteristics of the claimed tire structure are at least equivalent to those of comparable prior art tires then it would appear that this is an inherent consequence of the footprint shape and the tread pattern used.

As already indicated above the tread pattern of the tire of document D1, representing the closest state of the art, corresponds to that defined in claim 1. The appellants also concede that if that tread pattern is combined with a footprint shape as defined in the claim, ie two trapezoidal contact patches arranged with their longer bases along the aqua channel, then the technical effect mentioned at the end of the claim will be the automatic consequence. It can therefore be seen that the issue of inventive step resolves to the question of whether it was obvious for the person skilled in the art, seeking to put the teachings of document D1 into practice and to provide a low profile tire with good wet and dry handling characteristics, to adopt a footprint for the tire having the claimed form.

Here the Board considers document D26 to be of particular relevance. It can be seen from this that it was general knowledge that a low aspect ratio tire, in order to reduce irregular wear across the width of the tread, should have a footprint of substantially hexagonal shape, ie comprising two trapezoidal areas arranged with their longer bases extending along the centre line of the tread.

The application of this generally known configuration to the low aspect ratio tire of document D1, in which the footprint is divided centrally by the aqua channel, will result as a matter of course in two trapezoidally shaped contact patches each with their longer base extending along the aqua channel.

The appellants argue that the person skilled in the art, despite the general considerations discussed above, would nevertheless not opt for a footprint shape as defined in their claim in relation to the tire disclosed in document D1. In particular they seek to show that this person would understand document D1 as teaching a footprint of "butterfly" shape (ie with contact patches which are shorter along the aqua channel than at the edge of the footprint). The consequence of this would be a funnelling of water towards the aqua channel rather than a pumping of water away from it by means of the lateral grooves, as in the claimed tire. The Board cannot accept that this interpretation is the one the person skilled in the art would give to document D1. In the view of the Board the document is effectively silent as to the form of the footprint so that the person skilled in the art will have to choose this on the basis of his general

knowledge, in particular taking account of the need to avoid irregular wear across the width of the tread, and in a way which will make most effective use of the tread pattern disclosed in the document. Of particular relevance here is the passage in column 2, lines 30 to 34, quoted above, which indicate that the lateral grooves provide water channelling passages from the centre of the tread to the tread edge. At a linguistic level the comment of the appellants that this statement merely requires passages to be present which extend between the centre and the edge of the tread, the direction in which water is channelled through them not being specified, can perhaps be seen as being formally correct, but at a technical level the Board has no doubt that the skilled person would understand this as meaning that in practice the lateral grooves are intended to channel water outwardly.

Having regard to the above the Board therefore comes to the conclusion that the subject-matter of the claim lacks inventive step (Article 56 EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani F. Gumbel