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D E C I S I O N
of 6 February 1996



Case Number: T 0676/94 - 3.2.1

Application Number: 89302900.9

Publication Number: 0335588

IPC: B60C 9/22

Language of the proceedings: EN

Title of invention:
Radial tyre

Patentee:
SUMITOMO RUBBER INDUSTRIES LIMITED

Opponent:
COMPAGNIE GENERALE DES ETABLISSEMENTS MICHELIN MICHELIN ET CIE

Headword:
Radial tyre/SUMITOMO

Relevant legal provisions:
EPC Art. 83, 100(b), 111(1)

Keyword:
"The contents of a technical periodical regarded as part of the average knowledge of the skilled person"
"Undue burden of search for selecting this technical periodical (no)"
"Sufficiency of disclosure (yes)"
"Remittal of the case to the first instance for a further decision on the as yet unexamined issue of patentability"

Decisions cited:
T 0171/84, T 0051/87, T 0475/88, T 0611/90

Catchword:

The answer to the question whether or not the contents of a technical periodical form part of the average knowledge of a skilled person and are thus to be taken into account on the issue of sufficiency of disclosure, depends on the facts of the case.

If the skilled person is working on the assembly of starting materials (in this case plastic fibres used to reinforce tyres) he can be expected to consult the relevant studies on these materials, especially those carried out by a very small number of manufacturers of these starting materials. Thus, these studies, even though disclosed in technical periodicals, are to be considered as part of the skilled person's average technical knowledge.



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Case Number: T 0676/94 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 6 February 1996

Appellant:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 16 June 1994
revoking European patent No. 0 335 588 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: F. Gumbel
Members: M. Ceyte
J. Van Moer

Summary of Facts and Submissions

- I. The appellant is proprietor of European patent No. 0 335 588 (application No. 89 302 900.9).

Claim 1 of the patent as granted reads as follows:

"1. A radial tyre comprising a pair of bead cores one disposed in each bead of the tyre, a toroidal carcass (5) having at least one ply of cords arranged radially of the tyre and turned up at the ends thereof around said bead cores, a tread (2) disposed radially outside the carcass (5), a belt (6) disposed radially outside the carcass (5) and radially inside the tread (2) and a band (7) disposed radially outside the belt (6) said band (7) comprising a ply composed of at least one cord (12) wound spirally and continuously in the circumferential direction of the tyre at 0 to 3 degrees to the equator of the tyre characterised in that the cord is a hybrid cord (12) comprising a high elastic modulus filament (10) and a low elastic modulus filament (11) twisted together, the hybrid cord having a low elastic modulus (EL) in a low elastic modulus zone between zero elongation and a predetermined specific elongation in the range of 2-7% and a high elastic modulus (EH) in a high elastic modulus zone above said specific elongation of the cord wherein low and high elastic moduli (EL and EH) change at a transitional point (V) derived from the load elongation curve (C) of the hybrid cord (12) being the intersection (X) of the tangent (S1) to the elongation curve (C) at zero elongation and the tangent (S2) to the elongation curve (C) at the break point."

- II. The patent was opposed by the respondent on the grounds of lack of patentability and insufficiency of disclosure.

The following state of the art, inter alia, was cited:

D3: Conference on "Hybrid Tyre Cords containing Kevlar Aramid", Dr Eugene R. Barron. ACS Rubber Division Meeting (8 to 11 April 1986) corresponding to the following technical periodical cited in the European search report:

"Kautschuk + Gummi Kunststoffe", volume 40 No. 2, February 1987, pages 130 to 135, "Hybrid Tyre Cords containing Kevlar Aramid". The author, Dr Eugene R. Barron, is Research Associate at E.I. du Pont de Nemours & Company, Inc. Fibres & Composites Development Centers Wilmington DE 19898 USA.

- III. In its decision of revocation given at oral proceedings and posted in writing on 16 June 1994, the Opposition Division held that the European patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by the skilled person (Articles 83 and 100(b) EPC).

The issue of patentability was left undecided.

- IV. The Appellant (Patent proprietor) lodged an appeal against this decision on 4 August 1994 and paid the prescribed fee on the same date.

The statement of grounds of appeal was filed on 24 October 1994.

The Appellant contested the alleged lack of disclosure, relying inter alia on a statutory declaration from Dr Kevin John Niderost stating that the patent in suit did provide the skilled person with sufficient information as to how he could achieve the curve "C" shown in Figure 4 in the patent in suit.

V. Oral proceedings were held on 6 February 1996.

The Appellant (Patent proprietor) requested that the decision under appeal be set aside and the patent maintained as granted, or in the alternative on the basis of an auxiliary request presented together with the statement of grounds of appeal.

The Respondent (Opponent) requested that the appeal be dismissed. In support of this request, he essentially made the following submissions:

- (i) Although the claimed invention concerns a radial tyre, no specific example or detailed embodiment thereof is given in the description of the patent in suit: the description does not specify whether the claimed load/elongation curve illustrated in Figure 4 is achieved by using dipped, i.e. rubber coated, yarns or undipped yarns, or dipped or undipped hybrid cords.

In particular the description in the patent in suit does not indicate the twist level of the starting yarns and the twist level of the hybrid cords thus obtained. However, as substantiated by document D3, the twist levels of the yarns and of the hybrid cords have a major effect on elongation and modulus properties.

In this respect is only stated that the hybrid cord according to the invention is formed by appropriately selecting the diameter, the number of filaments of each of the high elastic modulus yarns and of the low elastic modulus yarn and also by regulating the twisting conditions such as yarn angles (page 4 lines 52 to 54 of the description). Also tables 1a and 1b of the specification do not give specific information as to these parameters.

Thus the description in the patent in suit would not enable the skilled person to readily select at least four different parameters in order to obtain curve (C) in Figure 4, comprising, as claimed, a low elastic modulus zone between zero elongation and a predetermined specific elongation in the range of 2 to 7% and a high elastic modulus zone above said specific elongation of the hybrid cord. It is not accepted that it would be a routine matter for the skilled person to select these different parameters by experimentation to establish the desired curve and thus to achieve the claimed invention.

- (ii) Document D3, which contains information necessary for carrying out the claimed invention, is not cited in the European patent application as originally filed. This publication is a technical periodical which according to the case law of the Boards of Appeal is not normally part of the common general knowledge and cannot, therefore, be used to remedy insufficiency of disclosure.

VI. Contesting this view, the Appellant held that the description of the patent in suit was sufficiently complete and clear to enable those skilled in the art, even without having recourse to the technical periodical

D3, to implement the invention simply by applying their skill and knowledge. Any skilled person was aware of the influence of the twist level on the fatigue life of a radial tyre. This known empirical rule allowed the skilled person to select a narrow range of twist levels in order to realise the desired fatigue life of the radial tyre, as evidenced by the statutory declaration. Once the appropriate twist levels had been selected, the skilled person was in a position to carry out the claimed invention without any difficulty.

On the other hand, given the specific circumstances of the field concerned any practitioner was aware of the publications issued by the few companies producing the starting materials (fibres) needed. Hence document D3 certainly was part of the skilled person's average technical knowledge.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.
2. It is concerned with the issue of insufficiency of disclosure under Article 83 or 100(b) EPC, which was the sole ground for the revocation of the patent.

More precisely, the sole question at stake in the present appeal was whether or not the invention as claimed in claim 1 as granted is disclosed in a manner sufficiently clear and complete for it to be carried out by a skilled person.

3. Claim 1 as granted has been formulated so as to state in its pre-characterising portion all those features of the claimed subject-matter which are known from

JP-A-61 60303. According to the pre-characterising portion of Claim 1, a radial tyre of this kind comprises a band disposed radially outside the belt and having a ply composed of at least one cord wound spirally and continuously in the circumferential direction of the tyre.

It is pointed out in the introductory part of the description that such a band serves to prevent lifting caused by rotation of the tyre at very high speed (page 2 lines 22 to 23). The specification goes on to explain that this problem has not been satisfactorily dealt with by low modulus organic fibre cords such as nylon cords, so that those versed in the art have turned to higher modulus cords such as polyester, rayon or aromatic polyamide cords for the band (page 2 lines 24, 25). However the use of high modulus yarns, continuously and spirally wound, involves a problem when the raw tyre is mounted in the mould and vulcanised, because the swelling of the raw tyre required to fill the mould cannot be achieved. This is because the resistance to stretch of the band is excessively high and therefore the force necessary to press the tread and structure of the tyre against the inner face of the mould cannot be achieved thus making it impossible to vulcanise and mould the tyre correctly (page 2 lines 44 to 49).

4. The technical problem addressed and solved by the subject-matter of Claim 1 (page 2 lines 51 to 53 of the patent in suit) is to provide a pneumatic tyre particularly suitable for high speed passenger cars and ensuring not only high speed running without tyre vibration but also good quality vulcanising and moulding.

The solution to this problem as set forth in the characterising portion of claim 1 consists in the selection of a hybrid cord comprising a high elastic modulus yarn and a low elastic modulus yarn twisted together, with the hybrid cord having a low elastic modulus zone between zero elongation and a predetermined specific elongation in the range of 2 to 7% and a high elastic modulus zone above said specific elongation of the cord. In this context it is noted that the Board, in agreement with both parties, accepts that the term "filament" used in the patent in suit should correctly read "yarn".

Claim 1 further specifies the term "specific elongation" as being defined by the transitional point (v) derived from the load elongation curve (C), which is the intersecting point of a line orthogonal to the elongation axis passing through the intersection of the tangent (S1) to the elongation curve at zero elongation and the tangent (S2) to the elongation curve (C) at the break point.

It is observed, that the claimed curve (C) and also the transitional point V are clearly shown, for a specific example of the hybrid cord, in Figure 4 of the patent specification.

5. The Respondent (Opponent) did not contest that the claimed teaching effectively solves the problem underlying the patent in suit. It is clear that if the hybrid cord has a relatively low modulus of elasticity until 2 to 7% elongation it can stretch readily to allow the raw tyre to swell and fill the mould for proper vulcanisation and moulding. On the other hand, beyond the transitional point the cord has a high modulus of elasticity and can thus prevent tread separation and lifting at high running speeds. Vibration is not a

problem, firstly because the hybrid cord is wound in the manner set forth in the pre-characterising portion of claim 1, and secondly because tyre imbalance is not caused by faulty moulding.

However, the Respondent held that the description would not enable the skilled person to select four parameters (twist levels of the low elastic modulus yarns, of the high elastic modulus yarn and of the resulting hybrid cord) without exercising an inventive activity to obtain curve (C) in Figure 4 and thus arrive at the claimed teaching. This cannot be accepted:

6. The hybrid cord to which curve "C" in Figure 4 applies is said to be a twinned assembly of a high elastic modulus yarn (10) with a single low elastic modulus yarn (11). Curve "A" in Figure 4 is said to denote the elongation curve of the low elastic modulus yarn (11) which comprises 1260d nylon, and curve "B" is said to be the curve of a high elastic modulus yarn (10) comprising 1500d aromatic polyamide. Curve "C" is said to show the results of the hybrid cord twisted from two high elastic modulus yarns and a single low elastic modulus yarn (11) (page 4 lines 36 to 43 of the patent specification).

As is apparent from the foregoing, the starting materials of the exemplified hybrid cord are defined in terms of diameter and composition, the cord being prepared by combining two aromatic polyamide (often called "aramid") yarns of 1500d ("deniers") and a single nylon yarn of 1260d. The information given (1260d and 1500d) tells the skilled person the diameter of each of the yarns, since the denier value defines the diameter for a particular material. Thus a nylon yarn of 1260d means a nylon yarn which has a weight of 1260g for a length of 9000m. The density of nylon being known, it is

possible to calculate the diameter from the density and the length. In fact, it was not in dispute that a skilled person could be in possession of the starting nylon and aramid yarns.

Thus the skilled person knows the starting materials, and he is also aware of the result to be achieved, that is to say a hybrid cord whose load/elongation curve is in accordance with the curve "C" in Figure 4. It is true that the teaching of the European patent is incomplete in the sense that the information relative to the twisting conditions for the formation of the hybrid cord is not given *expressis verbis*. It is nevertheless stated on page 4 at lines 15 to 19 that the hybrid cord is formed by

"twisting (ply twist) one or several high modulus yarns 10 in one direction, and twisting (ply twist) one or several low elastic modulus yarns 11 in the same direction and then twisting (cable twist) the ply twisted high elastic modulus yarn(s) and low elastic modulus yarn(s) in reverse direction."

7. Faced with the problem of twisting the starting yarns and the resulting hybrid cord in such a way that the load/elongation curve of the twisted hybrid cord is in accordance with curve "C" in Figure 4, the Board can see no reason why the skilled person, by carrying out a number of simple twisting experiments, would not be able to arrive at curve "C". As already stated, the skilled person knows the starting materials, the result to be achieved - a hybrid cord having a curve corresponding to curve "C" in Figure 4 - and also the routine twisting experiments he has to perform on the starting yarns. The lack of alternatives in this respect appears to create a "one-way-street" situation, since the skilled person wishing to vary the twisting conditions in the routine

way would necessarily arrive at a hybrid cord having a load elongation curve corresponding to curve "C" in Figure 4 and thus falling within the terms of claim 1 as granted.

Although it is true that a relatively large number of experiments might need to be made in the present case, this does not change the fact that no practical difficulties have to be overcome in performing twisting experiments; and since the skilled person is guided by the result to be achieved, such experiments do not appear to be undue and to require inventive activity.

8. Furthermore, as will be substantiated below, the skilled person could well be expected to consult the technical periodical D3 to find the missing information, i.e. the twisting conditions for carrying out the claimed invention. This document relates to a scientific study or monograph on "Hybrid tyre cords containing Kevlar Aramid", that is to say aromatic polyamide or aramid supplied by Du Pont de Nemours under the registered trade mark "Kevlar".

The author of this article has undertaken a study involving 3-ply hybrid cords with two plies of 167 tex aramid (aromatic polyamide of 1503d) and one ply of 140 tex nylon (nylon of 1260d) to determine the effect of twisting conditions on the hybrid cord's properties. It should be noted that the starting yarns in the European patent specification and in this scientific study are in essence the same, since the dipping of the cords mentioned in D3 is considered not to change significantly the load-elongation behaviour of the yarns. Figure 7 illustrates the influence of nylon/aramid twist ratios and of the twisting of the cord on the load/elongation diagram. Each of curves (A), (B), (C) and (D) in Figure 7 has a low elastic modulus

zone between zero elongation and a predetermined specific elongation. Thus, regardless of both the twist ratio of the nylon and aramid yarns and of the twist value of the resulting hybrid cord, the hybrid cords tested in this study possess a load elongation curve encompassing the two low and high modulus zones defined in claim 1. It is also apparent that curve "D" in Figure 7, which is very similar to curve "C" in Figure 4 in the European patent in suit, gives a predetermined specific elongation (transition point) of about 5%, which therefore falls just in the middle of the claimed range.

9. At the oral proceedings, the Respondent (Opponent) thus rightly conceded that the study of document D3 would provide the skilled person with adequate information as to how he can determine the appropriate twisting conditions, enabling him to arrive at curve "C" in Figure 4 of the European patent in suit. However, the Respondent held that document D3 was a technical periodical whose contents, according to the established case law of the Boards of Appeal were beyond the average technical knowledge of the skilled person and therefore could not be taken into account on the issue of sufficiency of disclosure. The Board of Appeal does not endorse this interpretation in the specific circumstances of the present case.

In decision T 171/84 (OJ EPO 86, 95), the Board held that it is normally accepted that average technical knowledge is represented by basic handbooks and textbooks on the subject in question. Patent specifications were not normally part of the average knowledge of the skilled person, and could not therefore be used to remedy prima facie insufficiency (see point 5 and 6).

Similarly in decision T 475/88 (unpublished) the Board held that technical periodicals cannot normally be regarded as part of the average knowledge of the skilled person since the relevant information contained therein can only be obtained after a comprehensive search. On the other hand, the content of a monograph was considered to belong to this knowledge.

In decision T 51/87 (OJ EPO 91, 177) the Board referred inter alia to the above decision T 171/84 and held that, exceptionally, a patent specification could be regarded as forming part of the average knowledge of the skilled person if the circumstances were such that the field of search was a particularly new one and the information contained in the prior art patent specification was not yet available from textbooks.

10. In these circumstances, the Board considers that the question whether or not the contents of a technical periodical form part of the average knowledge of a skilled person when assessing sufficiency of disclosure, should be answered on the basis of the facts and evidence in each particular case. In the present case the following should be noted:

- (i) Technical periodical D3 was specifically mentioned in the European search report as being in the "A" category to illustrate the general technological background of the invention (often called "general state of the art").
- (ii) The study disclosed in this technical periodical was presented at the 129th meeting of the Rubber Division, American Chemical Society, New York, on 8-11 April 1986, which was presumably well attended by skilled persons in the field of tyre manufacture. Moreover, such a technical

periodical is also assumed to be widely read, at least in Germany, by those versed in the art.

- (iii) The specific point at issue is whether the skilled person, by combining two aramid yarns and one nylon yarn, is able in the absence of any information on the twisting values to obtain a hybrid cord whose load/elongation curve corresponds to curve "C" in Figure 4 in the patent in suit. In the present circumstances it can be assumed that the skilled person depending in his practical work on the knowledge about the nature and physical properties of the yarns to be used as a starting material when assembling tyres would try to get the most recent and best information thereof which for practical reasons cannot be immediately available from textbooks. He would therefore be aware of this scientific study, which deals with the assembly of the same aramid and nylon yarns and which was issued by a well known manufacturer of the aramid yarn sold under the trademark "Kevlar" and used in particular in making radial tyres.

In other words, the person skilled in the art does not have the whole technology at his fingertips, but he must be assumed to know the prior art which is part of the technical knowledge required in his professional work (see Mathély, *Le droit européen des brevets* 1978, page 210). When his work consists in preparing hybrid cords by combining aramid with nylon yarns, he can thus be expected, where practical difficulties arise, to consult the relevant studies on this subject especially those carried out by the very small number of manufacturers of these starting materials. The skilled person would not therefore need to conduct a

comprehensive search of the whole literature in order to identify technical publication D3.

Thus, in accordance with the above-mentioned jurisprudence of the Boards of Appeal this Board considers that the average skilled person in the present case was aware of the content of technical periodical D3, so that this document could be regarded as part of the average knowledge of the skilled person. U ←

11. It follows from the above considerations that the information disclosed in this document together with that contained in the patent in suit is sufficient to enable him to carry out the claimed invention. Accordingly the Board concludes that also for this reason the claimed invention meets the requirements of Articles 83 and 100(b) EPC.

12. The Opposition Division issued a decision exclusively upon insufficiency of disclosure and left the issue of patentability undecided. In such cases, according to the established jurisprudence of the Boards of Appeal, the matter is normally remitted to the first instance for consideration of the undecided issue.

It is true that in exercising its discretionary powers a Board must take into account the public's as well as the parties' common interest in having opposition proceedings conducted speedily and, as far as reasonably possible, without remittal. However, if as in the present case a substantive issue has not yet been examined, the Board's opting to consider that issue would mean that it was continuing the examination of the opposition. This is clearly not the task of a Board of Appeal (see in particular decision T 611/90 OJ EPO 93, 50, point 3 of the reasons) and would deprive the

parties of their right to have the issue examined, if necessary, by two instances.

Under these circumstances and in the exercise of its discretion under Article 111(1) the Board remits the case to the Opposition Division for a further decision on the issue of patentability.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution.

The Registrar:

S. Fabiani

The Chairman:

F. Gumbel

F. Gumbel

Geschäftsstelle
Begrübt/Certified Registry/Greife
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