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Datasheet for the decision of 14 June 2021

Case Number: T 0602/17 - 3.2.01

Application Number: 11181605.4

Publication Number: 2433814

IPC: B60C9/20, B60C9/00, D07B1/06

Language of the proceedings: EN

Title of invention:
Tires with high strengh reinforcement

Patent Proprietor:
The Goodyear Tire & Rubber Company

Opponent:
MICHELIN Recherche et Technique S.A.

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main request, auxiliary request (no)

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T 0213/87

Catchword:

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Beschwerdekammern

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Case Number: T 0602/17 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 14 June 2021

Appellant: (Opponent)	MICHELIN Recherche et Technique S.A. Route Louis Braille 10 1763 Granges-Paccot (CH)
Representative:	Louret, Sylvain M.F.P. MICHELIN Service juridique - Propriété Intellectuelle DCJ/PI - F35 - Site de Ladoux 23, place des Carmes - Déchaux 63040 Clermont-Ferrand Cedex 9 (FR)
Respondent: (Patent Proprietor)	The Goodyear Tire & Rubber Company 1144 East Market Street Akron, OH 44316-0001 (US)
Representative:	Kutsch, Bernd Goodyear S.A. Patent Department Avenue Gordon Smith 7750 Colmar-Berg (LU)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 9 January 2017 concerning maintenance of the European Patent No. 2433814 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	W. Marx
	O. Loizou

Summary of Facts and Submissions

I. The appeal of the opponent is directed against the decision of the opposition division to maintain European patent No. 2 433 814 in amended form on the basis of the claims of the main request filed on 29 July 2015 and the description filed during oral proceedings on 9 December 2016.

II. In its decision the opposition division held, *inter alia*, that the subject-matter of claim 1 of the main request was inventive over closest prior art document **E6** (US 2004/0016497 A1) in combination with the teaching of the skilled person, **E1** (EP 1 433 868 A1) or **E3** (EP 1 745 944 A2).

III. Oral proceedings before the Board took place on 14 June 2021.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (main request), in the alternative that the patent be maintained in amended form on the basis of the auxiliary request filed with its reply.

IV. Claim 1 according to the main request as upheld by the opposition division reads as follows:

"A pneumatic tire comprising a carcass (12, 14), two sidewalls (22, 24) spaced apart a distance, two beads (16, 18), a tread (15) disposed radially outward of a crown of the carcass (12, 14), and a belt structure

(26) radially interposed between the tread (15) and the carcass (12, 14), the belt structure (26) having Mega Tensile Steel (MT) reinforcing cords (36) having filaments with diameters ranging from 0.08 mm to 0.22 mm, characterized in that the reinforcing cords (36) have a 2 + 2 construction."

Claim 1 according to the sole auxiliary request, as compared to claim 1 of the main request, merely limits the claimed diameter range to 0.18 mm to 0.22 mm.

V. The appellant (opponent) essentially argued as follows:

The closest prior art document E6 showed (see Fig. 2) a tire structure as claimed and also a belt structure having cords with a 2+2 construction (Figures 3 and 4). E6 already indicated that using highest strength filaments enabled a better compromise between weight, strength and rivet (open space between cords in a layer), as did the contested patent. According to E6 (see tables 2, 6, 7 for 2+2 constructions), using filaments of a higher tensile strength and the same diameter enabled to increase the breaking strength of the belt while having the same gauge (and same weight when maintaining the EPI), or to obtain an equal breaking strength and lesser weight when reducing the EPI, whereas reducing the diameter enabled maintaining or even increasing the breaking strength as well as reducing the cord gauge (increasing the EPI enabled maintaining the breaking strength and reducing the weight, see table 7).

E6 only failed to teach the MT reinforcing cords. A belt structure comprising a 2+2 cord construction was disclosed in E6 (paragraph [0040]: element chosen from a limited list disclosing equal alternatives; see

T 1115/09 and T 730/01). It was also strongly suggested to use a 2+2 construction (see paragraph [0056]: "the *2+2 construction is known for its openness and good rubber penetration resulting from the openness*"), and most of the constructions of the comparative examples (tables 1-7, claims 24, 25, 28) were 2+2 constructions. Regarding the diameter ranges, E6 explicitly disclosed three ranges overlapping with the claimed range of 0.08 to 0.22 mm (paragraph [0041]: 0.10 to 0.45 mm, more preferably 0.14 to 0.43 m, or even 0.18 to 0.38 mm). To assess novelty, it was necessary (according to the case law of the Boards of Appeal) to determine if one skilled in the art would seriously contemplate using the diameters in the claimed range. The disclosure of the lower limit of the ranges disclosed in E6 was novelty destroying. Irrespective of the examples in the tables only disclosing diameters 0.30 mm or 0.35 mm outside the claimed range, the whole content of the application gave an indication to use smaller diameters and also a 2+2 construction. Even the granted patent showed 2+2 constructions with 0.35 mm filaments. The three examples in table 7 of E6 did not teach to change from a 2+2 to a 2x construction when moving to higher tensile strength, but that a reduced diameter or reduced EPI resulted in lower tire weight. E6 even stressed the good characteristics of the 2+2 construction as regards rubber penetration.

The patentee tried to get a patent for a simple transposition of a solution already known from E6 (UT filaments replacing ST or HT filaments, based on a technical problem identical to the one exposed in the contested patent) to the highest tensile strength available at the time of filing (i.e. MT filaments). Such simple substitution of a known material (i.e. UT filaments) by another material (i.e. MT filaments) was

not patentable (see T 213/87). The A1-publication of the patent discussed in parallel UT and MT reinforcing cords having the diameter ranges according to claims 1 and 3 of the main request (see paragraphs [0031] and [0037], [0046] and [0053]) and showing same benefits (paragraphs [0064] and [0066]), so changing from UT to MT filaments did not provide any special technical effect. However, if the technical effect of changing the UT filaments for MT filaments was to raise the tensile strength of the filaments, the objective problem was to have a better balance between weight and strength. This balance could be identified by the ratio of the breaking strength of a belt structure BS (of a given thickness and 1 meter length) and its weight W, which was only dependent on the tensile strength TS of each filament (TS was higher the higher the steel class and the smaller the filament's diameter was, see E3). So the problem could be reformulated in an equivalent manner of obtaining highest tensile strength filaments.

Starting from a 2+2 UT cord structure having a diameter of 0.18 mm (lower limit disclosed in E6), a man skilled in the art would look for the highest tensile strength filaments available, i.e. MT filaments, as prompted already by E6 (paragraph [0007]: "*take advantage of new cord modulus*"; see also paragraph [0019] or table 7). Moreover, according to E1, the continual goal was to raise the tensile strength of the filaments used in the belt structure of tires, as obtained by using MT filaments (see paragraphs [0006], [0007] and [0062]).

Assuming that E6 (showing e.g. 2+2x0.30 UT filaments) did not show the claimed diameter range range as well, the objective problem was to have a better balance between weight and strength, or reformulated (see above: dependency of ratio BS/W), to get the highest

tensile strength filaments and the lowest filament diameter acceptable. A higher fatigue life (argued by the respondent) was already achieved in E6 (see e.g. paragraph [0058]), as was in the contested patent. Additionally choosing the claimed range between 0.08 mm and 0.22 mm was an arbitrary choice without any specific technical effect, as demonstrated by the fact that no comparative example was given in this respect in the contested patent. Moreover, E1 disclosed (see paragraphs [0057], [0061] and [0062]) MT filaments having a diameter of 0.20 mmm.

In order to get the best balance BS/W, it was required to get the highest steel class available and smallest possible diameter. Therefore, the subject-matter of claim 1 was obvious in view of the general knowledge of the person skilled in the art or in view of E1.

VI. The respondent's (patent proprietor's) arguments relevant to the present decision may be summarised as follows:

E6 represented the closest prior art and disclosed (paragraph [0041]) in particular filaments having a diameter in the range of 0.18 to 0.38 mm, which overlapped with the claimed range according to the main request, and a variety of possible cord constructions (paragraphs [0038] to [0040]). A 2+2 construction was shown in principle, but used UT steel. In order to arrive at the subject-matter of claim 1 of the main request, the skilled person had to make a selection in terms of three parameters: 2+2 cord construction, the claimed diameter range and MT instead of UT steel. The embodiments in E6 showing a 2+2 construction (table 2, 5, 6 or 7; also paragraph [0056]) only used filaments having a diameter of 0.30 mm or 0.35 mm. Cords with

filaments having a diameter of 0.18 mm were disclosed for a 2x construction (see table 3). Moreover (see paragraph [0068]), a 2+2x0.30HT configuration was replaced with a simpler 2x0.30UT or 2x0.23UT configuration. Thus, E6 prompted to favour a 2x over a 2+2 construction when looking for a replacement with equal strength and reduced diameter. The skilled person would start from the concrete embodiments in E6 and consider the complete teaching of E6, which taught away from using a 2+2 construction.

Starting from E6 the problem was (as argued during the oral proceedings) to provide a better balance between weight and tire performance (meaning a higher fatigue life), as solved by claim 1.
There was no prompting to use MT steel or the claimed diameter range and construction. The MT cord structure provided benefits (see paragraphs [0045] and [0047] of the contested patent) such as a reduction in gauge resulting in lighter weight and less costly tires with similar performance, and enhanced rubber penetration (which was even better in the 2x construction of E6) by smaller diameter and simpler cord constructions made achievable by MT steel filaments. In particular, UT and MT steel filaments were not disclosed in the contested patent as being equivalent.
The skilled person was confronted with a variety of possibilities or parameters to solve this problem (number of cords, cord construction, diameter of filaments, degree of twisting of filaments, distance of filaments, material of filaments etc., also rubber composition, thickness and geometry of belt structure etc.). Therefore, it was not obvious that the skilled person would consider at all the cords to solve the above mentioned problem. But even if he would do so, he would use e.g. a lighter 1x2x or 1+2 construction

instead of a 2+2 construction. However, according to the invention, it was important not only to reduce the tire's weight but also to maintain or even increase the strength of the belt structure. The claimed invention provided a good compromise in this respect. The skilled person starting from E6 would not arrive at the claimed solution in view of his common general knowledge, as he had to choose specifically three parameters without having any guidance in E6 (as MT steel was not known from E6, and a 2+2 construction was only disclosed for a diameter of the filaments of at least 0.30 mm).

Document E1 disclosed the production of MT steel and its use in tires (paragraphs [0002], [0007], [0057], [0061]), in particular the manufacturing of a wire having a tensile strength of at least 3800 MPa at a wire diameter of 0.35 mm (see claim 1). E1 did not describe the use of cords of corresponding wires in tires, nor the use of a 2+2 construction and the use of filaments having a diameter in the range of 0.08 mm to 0.22 in tires. The diameter of 0.2 mm recited in the above paragraphs did not relate to an embodiment of the invention according to E1, but was only used to show that the wires complied with the definition of MT steel at 0.20 mm. Only paragraph [0001] in E1 was about the manufacturing of a wire at diameters of 0.2 to 0.4 mm. Starting from E6 the skilled person was possibly taught by E1 to manufacture filaments from MT steel and to use them in tires, but not to use the claimed cord construction and range of filament diameters. A tire having such belt structure was a good compromise in respect of weight and strength, since it showed a higher load, a relative open reinforcement structure, a higher rivet (or lower number of ends per inch EPI) at comparable strength and low weight.

Reasons for the Decision

1. Main request - inventive step

1.1 The subject-matter of claim 1 of the main request does not involve an inventive step (Article 56 EPC).

1.2 The closest prior art is undisputedly represented by document E6, which shows in Figure 2 a partial cross section of a pneumatic tire identical to the cross section shown in Figure 2 of the contested patent (even with same reference numbers). Therefore, the structural features of the pneumatic tire specified in claim 1 of the main request (i.e. a carcass, two sidewalls, two beads, a tread, a belt structure radially interposed between the tread and the carcass) are disclosed in E6. Moreover, E6 shows (Figures 3 and 4) a belt structure comprising reinforcing cords having a structure of multiple filaments, which has not been contested.

1.3 The improvement provided in E6 was to go for the next higher strength steel alloy available, namely from HT or ST steel to UT steel. As acknowledged by the appellant, E6 failed to teach MT reinforcing cords. The matter of dispute was whether a 2+2 cord construction and filaments with diameters ranging from 0.08 mm to 0.22 mm as specified in claim 1 of the main request were also disclosed in document E6.

1.3.1 Regarding the cord construction, Figures 3 and 4 in E6 illustrate cross sections of a cord and of a composite structure (two abutted plies) of a tire according to the invention described in E6 (see paragraphs [0013] and [0014]), which represent a 2+2 construction as explicitly stated in paragraph [0056]. Paragraph [0056]

(describing the working example shown in Figure 3) even describes the advantageous properties of cords having a 2+2 construction, which is known for its openness and good rubber penetration, thus strongly suggesting to use a 2+2 construction. Moreover, this embodiment is in line with paragraph [0040] reciting a list of preferred cords used in a belt structure of the invention according to E6, which comprises 2+2 cords, and also with many of the comparative examples discussed in E6 (see in particular tables 2, 6 and 7).

Therefore, the Board finds that a belt structure of a tire having reinforcing cords and a 2+2 construction is known from E6. The respondent's argument that the skilled person starting from E6 as the closest prior art would have to make a selection in terms of three parameters, one of which allegedly being the claimed 2+2 construction, cannot be followed.

1.3.2 The preferable range of filament diameter disclosed in E6 (see paragraph [0041]: 0.18 to 0.38 mm) as admitted by the respondent overlaps with the claimed range of 0.08 to 0.22 mm according to the main request. Moreover, according to the general disclosure in E6 (see paragraph [0040]), one of the preferred cords among a list of possible cord constructions used in a belt structure is a 2+2 construction. While the claimed diameter range includes the end values which could be considered to be disclosed in E6 and the claimed cord construction could be considered to be a selection from a list disclosed in E1, the question of disclosure of the claimed combination of parameters cannot be answered in the affirmative by considering the range of overlapping diameters and the selection from a list separately.

Even if the skilled person might seriously contemplate working within the area of overlap of filament diameter, the Board does not see any suggestion in E6 for selecting the overlapping range (0.18 to 0.22 mm) in combination with a 2+2 cord construction. As argued by the respondent, the embodiments discussed in E6 (tables 2, 5, 6, 7; also paragraph [0056]) show the 2+2 construction only in combination with larger diameters (e.g. 0.30 mm or 0.35 mm), so E6 does not provide a clear technical teaching to the person skilled in the art on a combination of the claimed diameter range and cord construction.

1.3.3 The assessment of inventive step therefore has to start from a combination disclosed in E6, i.e. from a known 2+2 UT cord contruction having filaments with diameter 0.30 mm or 0.35 mm. The Board concurs with the respondent insofar that the subject-matter of claim 1 according to the main request differs from E6 not only in the material used for the reinforcing cords, but also in the claimed diameter range of the filaments. Therefore, the claimed solution cannot be considered as a simple transposition of a solution known from E6 (i.e. a change to higher steel grade), as alleged by the appellant.

1.4 Using filaments having a reduced diameter saves weight and meets the higher fatigue life requirements (as stated in the contested patent, see paragraph [0003]), whereas using MT steel instead of UT steel gives rise to the possibility of adjusting the parameters of a tire belt gross load (see paragraph [0007] of the contested patent, which, *inter alia*, depends upon the number of cord ends per inch (EPI)).

Starting from E6 the problem therefore can be seen in providing a better balance between weight and tire performance. The term "tire performance" is rather general and comprises characteristics such as fatigue life and strength of the tire (as referred to by both the appellant and the respondent).

1.5 It is noted that E6 is already concerned with the problem of providing cord structures which result in lighter weight and improved tire performance (see paragraphs [0008], [0009]; also paragraph [0003]). Moreover, E6 explicitly states (see paragraph [0007]) to "*take advantage of a new cord modulus*", which changes for higher strength steel (paragraph [0006]). This gives a clear hint to monitor developments in the field of materials for tire cords or filaments.

Therefore, the person skilled in the art starting from E6 is already prompted to look for prior art relating to improvements in the field of filaments or wires used in tires. He would then find document E1 (title: "*High strength, high carbon steel wire*"). E1 discloses a wire manufactured in a specific process, resulting in a wire with a tensile strength falling under the definition of MT steel (as explicitly stated in paragraph [0008]) with diameters of 0.2 to 0.4 mm, in particular 0.2 mm (paragraphs [0001], [0007] and [0057]). The Board does not share the respondent's view that the diameter of 0.2 mm was only used to show that the wires complied with the definition of MT steel at 0.2 mm, since E6 explicitly refers to the manufacturing of filaments of 0.2 mm diameter (see paragraph [0007]: "*for instance, having a diameter of 0.2 mm, made with the alloys and processing technique of this invention, have a tensile strength ...*"). E1 also describes the use of cords of

corresponding wires in tires (see paragraph [0062]), contrary to the allegation of the respondent.

1.6 In view of the the teaching in E6 to replace HT and ST steel filaments by higher grade UT steel filaments and the clear hint in E6 to "*take advantage of a new cord modulus*" (paragraph [0007]), it is obvious for the skilled person to use the MT steel wires of E1 (which could be produced according to the process disclosed in E1) in cord constructions known from E6. As demonstrated by the benefit analysis for a given tire in Table 6 of E6 (see also paragraphs [0070], [0071]), using a higher steel grade for a 2+2 construction having filaments of same diameter 0.30 mm results e.g. in equal strength and lower tire weight (when reducing EPI) or increased strength (when maintaining EPI), i.e. solves the above mentioned problem of balancing weight and performance. Therefore, the Board cannot see an inventive step in going from the known 2+2 construction of UT steel filaments disclosed in several examples in E6 to MT steel filaments as suggested by E1.

Moreover, E6 suggests to reduce the filament diameter further in a given 2+2 construction when changing to a higher steel grade. As shown in Table 7, a reduction in filament diameter (from 0.35 to 0.30 mm) when using a higher steel grade filament (UT instead of ST steel) in a 2+2 construction provides the benefit (when slightly increasing EPI) of equal strength and lower tire weight, and Table 2 shows that the maximum cord gauge (thickness) is also reduced. Maintaining the cord construction while reducing the filament diameter thus also solves the above mentioned problem. Therefore, the Board does not share the respondent's view that the skilled person in view of the problem posed was only

told to use a lighter 2x or 1+2 construction instead of a 2+2 construction when using higher strength steel.

1.7 It remains to be assessed whether a reduction in filament diameter to the claimed range (having an upper limit of 0.22 mm) involves an inventive step.

According to E1, MT steel wires having a diameter of 0.2 mm can be produced and are thus available to the person skilled in the art. E6 makes already clear that a 2+2 cord construction was commonly used in passenger and light truck tires (see paragraph [0004]: "*with the advent of high tensile filament such as in Assignee's 2+2xcord, disclosed for use in passenger and light truck tires ...*") and also in medium truck belts (see Table 2), i.e. over a wide range of tires for different tire belt gross loads or values of breaking strength of the belt structure. Admittedly, the cord structure of the exemplary passenger or light truck belts discussed in Table 2 of E6 have a 2x construction (with filament diameter of 0.23 or 0.30 mm e.g.). However, as shown by the basic calculations of the appellant in its grounds of appeal (see paragraph bridging pages 28 and 29), when going to smaller filament diameters the breaking strength of the breaking structure is reduced if not compensated for by increasing the EPI. This, however, would reduce the rivet (open space between cords) and thus the rubber penetration. Thus, it is an obvious measure to change instead from a 2x construction to e.g. a 2+2 construction (which doubles the number of filaments per cord and thus the breaking strength and is known according to to E6 for its good rubber penetration). In view of this basic knowledge of one skilled in the art, the Board cannot follow the respondent in that the skilled person was tempted to use lighter cord constructions such as a 2x

construction when changing from UT to MT steel filaments and reducing the filament diameter.

Moreover, the contested patent itself recites filaments of MT steel with diameters in the claimed range and example cord constructions 2x, 2+1 and 2+2 without mentioning any specific technical effect associated with one of this cord constructions (paragraph [0040]). In this respect, no comparative examples are given. This also indicates that choosing the cord construction depends on the tire specification (which is not specified in claim 1) and is selected accordingly.

Therefore, the Board finds that in view of the wide range of applications for a 2+2 construction already suggested in E6, choosing a MT steel filament with diameter 0.2 mm (as known from E1) in combination with a 2+2 construction depends on the load requirements of the tire (namely its belt gross load or belt strength) and falls within the scope of the normal design procedure followed by the person skilled in the art and cannot justify the presence of an inventive step.

1.8 The skilled person starting from E6 and taking into account the teaching of E1 in view of the above mentioned problem would therefore arrive in an obvious manner at a pneumatic tire falling within the claimed range of filament diameter (0.2 mm as proposed in E1).

2. Auxiliary request - inventive step

For the reasons set out above in respect of the main request, also the subject-matter of claim 1 of the auxiliary request does not involve an inventive step (Article 56 EPC).

The skilled person starting from E6 as the closest prior art (suggesting a 2+2 construction) and taking into account the teaching of E1 (MT steel filaments of 0.2 mm diameter) would arrive in an obvious manner in particular at filament diameters ranging from 0.18 mm to 0.22 mm, as specified in claim 1 of the auxiliary request.

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:

D. Magliano G. Pricolo

Decision electronically authenticated