

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 2 August 2023**

**Case Number:** T 0758/21 - 3.5.05

**Application Number:** 16160401.2

**Publication Number:** 3219572

**IPC:** B61L3/00, B60L15/20

**Language of the proceedings:** EN

**Title of invention:**

METHOD OF PROVIDING A DRIVING RECOMMENDATION TO A DRIVER OF A  
TRAIN AND TRAIN DRIVER ADVISORY SYSTEM

**Patent Proprietor:**

KNORR-BREMSE  
Systeme für Schienenfahrzeuge GmbH

**Opponent:**

Siemens Mobility GmbH

**Headword:**

PROVIDING A DRIVING RECOMMENDATION AND ADVICE TO A DRIVER OF A  
TRAIN / KNORR

**Relevant legal provisions:**

EPC Art. 54

**Keyword:**

Novelty - (no)

**Decisions cited:**

G 0007/95



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 0758/21 - 3.5.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.05**  
**of 2 August 2023**

**Appellant:** KNORR-BREMSE  
(Patent Proprietor) Systeme für Schienenfahrzeuge GmbH  
Moosacher Strasse 80  
80809 München (DE)

**Representative:** Prüfer & Partner mbB  
Patentanwälte · Rechtsanwälte  
Sohnckestraße 12  
81479 München (DE)

**Respondent:** Siemens Mobility GmbH  
(Opponent) Otto-Hahn-Ring 6  
81739 München (DE)

**Representative:** Siemens Patent Attorneys  
Postfach 22 16 34  
80506 München (DE)

**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
8 April 2021 concerning maintenance of the  
European Patent No. 3219572 in amended form.**

**Composition of the Board:**

**Chair** A. Ritzka  
**Members:** N. H. Uhlmann  
F. Blumer

## Summary of Facts and Submissions

I. The appellant-patent proprietor appealed against the opposition division's interlocutory decision to maintain European patent No. 3 219 572 in amended form according to auxiliary request 4.

II. The decision under appeal made reference to, *inter alia*, the following documents:

D01 "Optimierung von Fahrweisen im spurgeführten Verkehr und deren Umsetzung", Linder, Ulrich, Doctoral Thesis, 2 June 2004

D02 SCHLUSSBERICHT der TECHNISCHEN UNIVERSITÄT DRESDEN - Band 6, Die flexible S-Bahn: Energiesparende und anschlussoptimierende Flexibilisierung der Fahrweisen und Fahrzeiten, das neuartige Fahrassistenzsystem ENAflex-S, Steffen Oettich, 31 January 2005

D03 US 2011/0288765

D04 EP 2 955 483

D05 DE 10 2013217310

D06 WO 01/08956

D07 US 2007/0219680

D08 WO 2011/060122

III. In its statement setting out the grounds of appeal, the appellant requested that the decision under appeal be set aside, the opposition be rejected and the patent be maintained as granted or, on an auxiliary basis, the patent be maintained according to one of auxiliary

requests 1 to 3, all as underlying the contested decision.

The respondent-opponent filed a reply to the appeal and requested that the appeal be dismissed.

- IV. By letter dated 5 July 2022, the parties were summoned to oral proceedings.
- V. In a letter dated 11 July 2022, the appellant submitted further arguments.
- VI. In a communication under Article 15(1) RPBA, the board set out its provisional opinion on the case.
- VII. The appellant and the respondent submitted further arguments by letters dated 29 June 2023 and 6 July 2023, respectively.
- VIII. At the oral proceedings, which took place as scheduled, the allowability of the requests on file was discussed with the parties.
- IX. Final requests

The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or on the basis of any of auxiliary requests 1 to 3 on which the decision under appeal was based.

The respondent (opponent) requested that the appeal be dismissed.

X. Claim 1 of the main request is worded as follows:

"Method of providing a driving recommendation to a driver of a train (1) during operation of the train, the driving recommendation being based on a distance ( $D_{seg}$ ) and an altitude profile (32) of a trip segment to be covered by the train, a travel time limit for the trip segment, and velocity limits (20) along the trip segment,

wherein the method comprises the steps of:

defining an initial state (10) of the train on the basis of an actual position of the train and an actual velocity of the train,

defining a goal state (12) of the train on the basis of a goal position and a goal velocity at the end of the trip segment to be covered by the train,

determining an energy-optimized velocity profile (18) between the initial state of the train and the goal state of the train, with the energy-optimized velocity profile being determined by a graph based optimization algorithm, constrained by the travel time limit for the trip segment and the velocity limits along the trip segment, and

providing the driving recommendation to the driver on the basis of the energy-optimized velocity profile."

XI. Claim 1 of auxiliary request 1 is based on claim 1 of the main request and includes the following additional wording:

"wherein the driving recommendation comprises at least one of:

a train velocity recommendation, derived from the energy-optimized velocity profile (18) and the actual position of the train, and

an acceleration recommendation, derived from the energy-optimized velocity profile (18), the actual velocity of the train and the actual position of the train, with the acceleration recommendation recommending one of an accelerating, a braking, and a maintaining of the velocity of the train."

XII. Claim 1 of auxiliary request 2 is based on claim 1 of the main request and includes the following additional wording:

"wherein the step of determining the energy-optimized velocity profile (18) between the initial state (10) of the train and the goal state (12) of the train by the graph based optimization algorithm comprises:

defining a grid of intermediate states (14) between the initial state and the goal state,

defining a plurality of grid edges (16) between the initial state, the grid of intermediate states and the goal state, the plurality of grid edges forming a plurality of paths from the initial state to the goal state via the grid of intermediate states,

for each of the plurality of grid edges, determining an energy consumption of the train and determining a

required travel time of the train along the respective grid edge, and

determining an energy-optimized path from the initial state to the goal state on the basis of the energy consumption of the train along the plurality of grid edges, with the required travel time along the grid edges of the energy-optimized path being within the travel time limit."

XIII. Claim 1 of auxiliary request 3 is based on claim 1 of auxiliary request 2 and includes the following additional wording:

"wherein each of the intermediate states (14) is defined by a respective distance value and a respective train velocity value or wherein each of the intermediate states is defined by a respective travel time value and a respective train velocity value."

### **Reasons for the Decision**

1. The patent in suit pertains to a method of providing a driving recommendation to a train driver during operation of the train. The recommendation is based on the physical characteristics of a trip segment and the travel time. An energy-optimised velocity profile is determined using a graph-based optimisation algorithm. The recommendation is determined based on this velocity profile.
2. Document D01 discloses methods for generating optimised running profiles for a train and providing corresponding recommendations to the driver.



## **Main request**

### 3. Novelty

3.1 The appellant argued that because the opposition division decided that the subject-matter of claim 1 was novel but did not involve an inventive step, the board was not competent to examine the novelty of the subject-matter of claim 1.

The board holds that it is competent for the following reasons.

Firstly, novelty (Articles 100 a) and 54 EPC) is a ground for opposition in the current case. Secondly, the prohibition of *reformatio in peius* relates to the legal effects of a decision and not to the reasons. In the case at hand, the opposition division decided that the main request and auxiliary requests 1 to 3 did not meet the requirements of the EPC and were thus not allowable. Thirdly, according to the last sentence of the headnote of decision G 7/95, the allegation that the claims lack novelty in view of the closest prior-art document may be considered in the context of deciding upon lack of inventive step, even when lack of novelty was not a ground for opposition. Finally, no ground for opposition set out in Article 100 EPC is "stronger" than the others.

3.2 According to the decision under appeal, document D01 disclosed all features of the subject-matter of claim 1 except that the algorithm is graph based.

3.3 The board holds that D01 also discloses a graph-based algorithm. Hence, the subject-matter of claim 1 is not novel.

3.4 The appellant argued that D01 did not disclose a number of features.

These arguments are not convincing for the following reasons.

3.5 Document D01 discloses a two-step optimisation algorithm (chapters 3.2, 3.3.1 and 3.3.4 on pages 44 to 52 and appendix C ("Anhang C") on pages 193 to 196, including Figures 68 and 69 and Tables 30 and 31):

- establishing a number of potentially interesting trip phases ("potenzielle Fahrphasen" on pages 50 to 52 and 193 to 196). Each trip phase is defined, *inter alia*, by the position and speed of the train at the beginning and end of the phase and the driving time
- establishing an optimal combination of the potential trip phases, with the end position and speed of a preceding phase being identical to the beginning position and speed of the following phase ("Bestimmung der optimalen Fahrweise" on page 196)

Figure 68 illustrates a combination of a number of potential trip phases. The beginning of a phase coincides with the end of a previous phase. The skilled reader recognises that a common beginning/end corresponds to a node and that the nodes are connected by edges between them. Hence, the phases, which are used during the optimisation, form a graph. For

instance, the node at coordinates (1.8; 80) is connected to the node at (2.5; 25). In fact, Figure 68 depicts a graph comprising nodes and edges, as do Figures 25 and 28 to 30, to which the decision under appeal refers in section 19.5.1.

Consequently, document D01 discloses a graph-based optimisation algorithm.

3.6 The appellant's argument that Figure 68 was only an illustration and did not disclose an optimisation fails to convince in view of the teaching on page 196 on determining optimal driving ("Bestimmung der optimalen Fahrweise"). The optimisation in D01 includes finding a combination of trip phases which meets the criteria of driving time and minimised energy consumption. Indeed, the document D01 in its entirety is dealing with optimising train driving.

3.7 The board agrees with appellant's argument that the method disclosed in D01 does not guarantee that globally optimised driving recommendations are established. However, the method as claimed does not provide such a guarantee, either.

3.8 The appellant referred to a number of paragraphs of the description and Figures 4 to 7 of the opposed patent.

The board notes that features disclosed in the description and drawings but not recited in a claim cannot contribute towards novelty of the claimed subject-matter.

3.9 The appellant argued that claim 1 recited a graph-based optimisation algorithm and that D01 disclosed a different, numerical optimisation algorithm.

The board holds that the algorithm disclosed in D01 is graph based, as explained above, and numerical. These

two algorithm characteristics are not mutually exclusive.

- 3.10 The appellant considered that D01 did not disclose "velocity limits during trip segment", i.e. a plurality of velocity limits.

The board agrees with the respondent that the velocity profile ("Geschwindigkeitsprofil") referred to on page 91 as a part of the trip data discloses a plurality of velocity limits. Table 37 on page 205 includes further details of the trip data and discloses a plurality of velocity limits under the category "Route geometry" ("Streckengeometrie").

- 3.11 According to the appellant, D01 did not disclose an irregular grid.

The board, however, notes that claim 1 does not include such a feature.

- 3.12 The appellant stated further that D01 disclosed "impossible states", while in the patent all intermediate states and edges were possible.

Yet claim 1 does not refer to any states or edges, be they possible or not.

- 3.13 The argument that D01 relied on a detailed simulation and not a robust graph-based optimisation is not convincing.

Firstly, claim 1 does not refer to a robust optimisation and does not specify any details of the graph-based optimisation which would make it robust.

Secondly, claim 1 does not exclude that the optimisation is based on a simulation.

3.14 The consideration of additional time allowance ("Fahrzeitreserve") in the method of D01 is not excluded by the wording of claim 1.

3.15 The appellant argued that D01 did not disclose giving driving recommendations in real time.

Firstly, claim 1 does not refer to any aspect of real time. Furthermore, the board agrees with respondent's submission that D01 discloses that driving recommendations are calculated in real time (see chapter 3.3.3 on page 49). It is self-evident that calculated driving recommendations are given to the train driver. Page 196 similarly discloses a real-time mode ("Online-Betrieb").

The appellant considered further that D01, on page 196, disclosed transition phases ("Übergangsphasen"), thus the calculation times were not short.

The board observes that these transition phases relate to the (physical) transition of a train from one (current) state to another, desired, state, e.g. by acceleration, and do not relate to any calculation time.

3.16 For these reasons, the subject-matter of claim 1 is not novel. Hence, the main request is not allowable.

### **Auxiliary request 1**

#### 4. Novelty

4.1 According to the decision under appeal, document D01 disclosed the features added to claim 1 (see point XI. above).

4.2 The appellant considered that according to the patent new optimisations took place during the driving of the train, i.e. a new energy-optimised velocity profile was established. This was not the case in D01.

The board disagrees. According to claim 1, a **recommendation** is derived from the energy-optimised velocity profile and **from the actual position** of the train. However, the energy-optimised velocity profile is not modified according to the actual position of the train. Furthermore, the respondent correctly pointed out that the current state of the train, i.e. the position and the speed of the train, are taken into consideration (D01, chapter 4.1 on page 91, "Position, Geschwindigkeit").

4.3 For these reasons and the reasons given for the main request, the subject-matter of claim 1 is not novel. Thus, auxiliary request 1 is not allowable.

### **Auxiliary request 2**

#### 5. Novelty

5.1 The opposition division held that document D01 disclosed the features added to claim 1 of auxiliary request 2.

- 5.2 The appellant stated that in D01 only the total energy consumption was determined, not the energy consumption of the train **for each** of the plurality of grid edges.

The board agrees that D01 does not explicitly disclose the determination of the energy consumption for each trip phase. However, it is clear that the total energy consumption for the trip is the sum of the energy consumption for each trip phase. Thus, to determine the total energy consumption of all trip phases combined (see the paragraph following Figure 69 on page 196), the consumption of each trip phase has to be determined. For these reasons, D01 implicitly discloses the determination of the energy consumption for each trip phase.

- 5.3 The appellant submitted in the grounds of appeal that D01 did not disclose grid edges **in combination with** a graph-based optimisation algorithm.

The board disagrees. As explained above, grid edges and a graph-based optimisation algorithm are disclosed on pages 193 to 196 of D01.

- 5.4 The appellant stated, referring to Figure 4 of the patent and states 10 and 12, that different paths were specified between states. This was not the case in D01.

The board does not agree. Figure 68 and Table 31 disclose different combinations of possible trip phases.

- 5.5 For these reasons and the reasons given for the main request, the subject-matter of claim 1 is not novel. Thus, auxiliary request 2 is not allowable.

### **Auxiliary request 3**

#### 6. Novelty

6.1 The opposition division held that document D01 disclosed the features added to claim 1 of auxiliary request 3.

The board agrees and notes that Figure 68 discloses a distance value (along the horizontal axis) and a respective train velocity value (along the vertical axis) for each state of the train.

6.2 The appellant observed that in D01, the position of the states could not be changed.

However, claim 1 does not require any changeability.

6.3 For these reasons and the reasons given for auxiliary request 2, the subject-matter of claim 1 is not novel. Thus, auxiliary request 3 is not allowable.

### **Conclusion**

In view of the above conclusions, none of the requests of the appellant is allowable. Thus, the appeal must be dismissed.



**Order**

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

The appeal is dismissed.

The Registrar:

The Chair:



A. Chavinier Tomsic

A. Ritzka

Decision electronically authenticated