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D E C I S I O N
of 8 October 2004

Case Number: T 0521/02 - 3.5.2

Application Number: 96114693.3

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Language of the proceedings: EN

Title of invention:
Rail navigation system

Applicant:
WESTINGHOUSE AIR BRAKE COMPANY

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2)

Keyword:
"Admissibility of the amendments (yes)"
"Novelty and inventive step after amendment (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0521/02 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 8 October 2004

Appellant: WESTINGHOUSE AIR BRAKE COMPANY
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 29 November 2001
refusing European application No. 96114693.3
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: J.-M. Cannard
B. J. Schachenmann

Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse European patent application No. 96 114 693.3. The reason given for the refusal was that the subject-matter of independent method claim 17 did not meet the requirement of Articles 52 and 54 EPC having regard to the prior art document D1: EP-A-0 561 705. The subject-matter of independent system claim 5 was considered as known from D1, or obvious having regard to the teaching of this document.

II. The documents:

D1: EP-A-0 561 705, and

D3: US-A-5 129 605,

cited in the Search Report, are relevant to the present appeal.

III. The current version of independent claims 1, 6 and 18, filed with the letter dated 21 September 2004, reads as follows:

Claim 1:

"A navigation system (10) mounted on a railway vehicle travelling on a track system, said navigation system (10) comprising:

 a storage device for storing a database (24),
 a rate of turn measuring apparatus (50) for measuring a rate at which such railway vehicle turns on a railway track,

a speed sensing device (40), for sensing rotation of a wheel of such railway vehicle so as to generate a signal indicative of at least one of speed of and distance travelled by the railway vehicle; and

a computing device (20);

wherein the storage device is adapted to store the database (24) including data pertaining to locations of railway track routes and locations and orientations of switches and curves in the railway track routes of the track system;

the rate of turn measuring apparatus (50) is adapted to generate a signal indicative of a turn rate of the railway vehicle;

the computing device (20) is adapted to derive a signal indicative of curvature of the railway track, on which the railway vehicle is travelling, from said signal indicative of turn rate and said signal indicative of at least one of speed and a distance, and to compare said signal indicative of curvature with said data pertaining to said locations and orientations of switches and curves in the track system for determining the position, which the railway vehicle occupies in relation to a particular one of the curves and the switches in said database (24), and to generate a position signal indicative thereof; and

the system (10) further comprises a means for using said position signal for at least one of an operator display, an input to a control means of the railway vehicle, and as a signal for computations in the computing device (20)."

Claim 6:

"A navigation system for a railway vehicle travelling on a track system, said navigation system (10) comprising:

radio navigation first means (30) adapted for generating a first signal indicative of a first position of the railway vehicle;

a database (24) disposed in a computer system (20) within the railway vehicle;

second means (50) disposed on the railway vehicle for communicating a third signal indicative of a turn rate; and

third means (40) disposed on the railway vehicle for communicating a fourth signal indicative of a speed of the railway vehicle to the computer system (20);

wherein the database (24) is adapted for providing a set of second signals indicative of a geographical disposition of switches and curves of the track system;

the second means (50) is adapted for communicating a signal indicative of the turn rate of the railway vehicle to the computer system (20);

the system (10) further comprises a set of fifth signals disposed within the computer system (20) to provide instructions for generating a sixth signal based on said third signal and said fourth signal, the sixth signal being indicative of a curvature of at least one of a curve and a switch, on which the railway vehicle is moving;

the computer system (20) having means for using said first signal to select a first portion of said set of signals representing a portion of the track system in a vicinity of said first position, and comparing said sixth signal with said first portion of said set

of second signals to generate a seventh signal indicative of a second position of the railway vehicle in relation to the database (24) at a time when the railway vehicle is traversing at least one of a curve and a switch;

the second position indicated by said seventh signal being more accurate than said first position indicated by said first signal; and

the computer system (20) having means for using said seventh signal for at least one of an operator display, input to a control means of the railway vehicle, and a signal for computations in the computer system (20)."

Claim 18:

"A method of determining a track identifier for a railway vehicle moving on a track in a track system, according to which a computer (20) disposed on the railway vehicle is provided, said method comprising the steps of:

providing the computer (20) with signals indicative of a track database (24) having information defining locations and orientations of curves, switches and track identifiers of the track system;

providing the computer (20) with at least one signal representative of an approximate position for the railway vehicle;

providing the computer (20) with at least one signal indicative of a time changing heading of the railway vehicle;

providing the computer (20) with at least one signal indicative of at least one of odometer reading and speed of the railway vehicle;

providing the computer (20) with signals indicative of instructions for determining an event of said railway vehicle passing over a switch of the track system based on said at least one signal representative of an approximate position of the railway vehicle and said at least one signal indicative of a time changing heading of the railway vehicle to generate a signal indicative of a particular switch on the track database and thereby generate a signal indicative of a track identifier for the railway vehicle; and

providing the signal indicative of said track identifier to at least one of an operator display and a train control system."

Claims 2 to 5 are dependent on claim 1, claims 7 to 17 are dependent on claim 6, and claims 19 and 20 are dependent on claim 18.

- IV. Oral proceedings were held on 8 October 2004. Nobody was present on behalf of the appellant, as foreshadowed in letter of 8 September 2004.

- V. The written arguments of the appellant can be summarized as follows:

Document D1 related to a method and apparatus for locating a vehicle on a railway track for analysis of the geometry of a specific portion of the track. The vehicle, when circulating on the track, collected a configuration parameter of the track (i.e. a curve radius). The position of the vehicle was determined on the basis of the collected track configuration, a reference configuration of the track stored in a database, and marking indications associated with the

reference configuration and markings in the terrain. Thus the position of the vehicle was determined in relation to ground infrastructure positioned outside the track system. The navigation system and method of the invention, in which the position of the train, and track identifiers for the railway vehicle, could be determined in relation to curves and switches anywhere in the track system, without requiring any ground infrastructure (markings in the terrain), were not disclosed by D1. The apparatus of D1 filtered out curves having a length shorter than 40 meters which were considered as defects of track and would not be able to identify the curvature of switches, because they were shorter than 40 meters. The teaching of D1 did not suggest that the location of the train could be determined without reference to markings in the terrain. It was unlikely that the skilled man would consider the teaching of D1 for arriving at the invention.

The navigation system according to claim 1 compared the real time data derived from a signal indicative of curvature of the track along with the turn rate and speed of the vehicle against the data set forth in the track system of the data base, which was not disclosed by document D3. The system recited in claim 6 differed from the system of D3 in that it incorporated multiple data inputs (the turn rate and the speed of the railway vehicle) to generate a signal indicative of the position of the vehicle in relation to a database in the computer at a time when the vehicle was traversing a curve or a switch in the railway system. Claim 18 related to a method of determining a track identifier for a railway vehicle which included several features not disclosed by D3, for instance providing a track

database with information defining locations and orientations of curves, switches and track identifiers of the track system and providing a computer with a signal indicative of a time changing heading of the vehicle.

VI. The appellant requested that the decision under appeal be set aside and that a patent be granted in the following version:

description: pages 6 to 9, 12 and 14, as originally filed;
pages 2A, 3, 5, 10 and 13 filed with letter of 8 March 2001;
pages 2 with insert on page 2B, 11 and 15 filed with letter of 8 September 2004;
pages 1 and 4 filed with letter of 21 September 2004;
(for avoidance of doubt: page 2A follows insert page 2B)

claims: 1 to 20, filed with letter dated 21 September 2004;

drawing: as originally filed.

Reasons for the Decision

1. The appeal is admissible.

2. The Board is satisfied that the claims and the description according to the present request meet the requirement of Article 84 EPC and do not contravene Article 123(2) EPC.

2.1 This applies in particular to present claim 1 which relates to a navigation system according to the first aspect of the invention as defined in the application as filed (see published application, column 1, line 51 to column 2, line 9) and described in detail as a preferred embodiment (column 3, line 43 to column 5, line 3) with reference to figure 1. According to this embodiment, the speed sensing device or apparatus (odometer 40) includes means for sensing rotation of a wheel of the vehicle for generating a signal indicative of the vehicle speed (column 4, lines 26 to 29); the rate of turn measuring apparatus or indicator (50) is mounted on the vehicle to provide the on-board computer with a signal indicative of the turn rate (figure 1); and the track database has information relating to the locations and orientations of curves and switches of the track system, since the curvature, which alternates from positive to negative or negative to positive, is compared with data in the database for determining the vehicle position (column 4, lines 32 to 43).

Apparatus claims 1 and 6 - Novelty and inventive step

3. The subject-matter of claim 1 is considered to be new (Article 54(1) EPC) because neither of the cited prior art documents discloses a navigation system mounted on a railway vehicle travelling on a track system, in which a computing device is adapted to compare a signal derived from the measured turn-rate of the vehicle and

indicative of the curvature of the railway track with data pertaining to locations and orientations of switches and curves in the track system for determining the vehicle position in relation to a particular one of the switches and curves. This applies in particular to document D1 (which, in the decision under appeal, was considered to anticipate claim 5 corresponding to present claim 1):

- 3.1 D1 (figures 1 and 2; page 2, lines 1 to 28) concerns an apparatus for determining the position of a railway vehicle on **a particular railway track** for localizing defects of the track. Successive samples of a parameter of the track (i.e. the curvature) for acquisition points separated by a given distance, which thus form a predetermined reference configuration of the track, and reference position markings for at least some of these samples **with respect to ground infrastructure** are stored in a reference memory (10) (page 4, lines 46 to 58). The measured parameter for the portion of the track over which the vehicle is passing is then correlated with the stored parameter samples for successive portions of the reference configuration to determine the current position of the vehicle on the track. The system recited in D1 can detect curves of a track by filtering the measured radius of curvature.

- 3.2 However, D1 does not disclose the determination of the position of a vehicle **in a track system**. It neither refers to switches, even implicitly (because a railway switch is neither reducible to a curve, nor to a specific radius of curvature). There is no disclosure in D1 of a database for storing data pertaining to **locations and orientations of discrete portions of the**

- track identified as curves, and a fortiori switches,** of a track system. Nor does D1 disclose the comparison of a signal indicative of the measured curvature of a track with stored data pertaining to locations and orientations of such curves and switches.
4. The closest prior art is formed by D3 (figures 1 and 2; column 1, lines 5 to 10; column 4, lines 10 to 14 and line 56 to column 7, line 3; column 6, lines 1 to 8), which discloses a navigation system mounted on a vehicle travelling on a track system and comprising a storage device storing data pertaining to track routes of the track system for determining the position of the vehicle with respect to the track.
 - 4.1 In addition to the feature relating to the comparison of the current track curvature with stored data relating to curves and switches in the track system (see above, paragraph 3), a rate of turn measuring apparatus and a database including locations and orientations of switches and curves of the track system are the other features of claim 1 not disclosed in D3.
 - 4.2 It is observed that the computer according to D3 determines the position of the vehicle as a route distance along the track with reference to ground infrastructure (column 1, lines 59 to 62; column 4, lines 46 to 62; column 6, lines 25 to 40).
 5. Starting from D3 and having regard to the technical effects provided by the invention, the objective problem can be seen as providing a navigation system which can determine the position of a railway vehicle travelling on a track system without requiring the use

of any ground infrastructure (such as track circuits and/or transponders), as mentioned in the application (see column 2, lines 49 to 54 of the published application).

- 5.1 The claimed solution to this problem is to determine the position of the vehicle with respect to switches and curves of known position in the track system by providing the features identified in paragraph 4.1.

- 5.2 No disclosure, or suggestion, of such a solution can be found anywhere in the cited prior art documents, taken alone or in combination, because none of these documents discloses a computer provided with a database including positions and orientations of switches and curves in the track system. The skilled person would not consider the combination of D3 with D1, because it would not provide a solution to the technical problem.

6. Claim 6 relates to a navigation system which differs from the navigation system according to claim 1 essentially in that additional "radio navigation first means" generate a signal indicative of a first position of the railway vehicle and the signal indicative of the curvature of the track portion on which the vehicle is moving is compared with signals selected from the database to represent a portion of the track system in the vicinity of the first vehicle position. Claim 6 thus relates to an alternative solution to the problem of determining the position of a vehicle in a railway track system without referring to ground infrastructure. The subject-matter of claim 6 is considered to be novel and to involve an inventive step for the same reasons as the subject-matter of claim 1.

Independent method Claim 18 - Novelty and inventive step

7. The subject-matter of claim 18 is considered to be new (Article 54(1) EPC) because none of the cited prior art documents discloses a method of determining a track identifier for a railway vehicle moving on a track in a track system which comprises a determination in an on-board computer of an event of a railway vehicle passing over a particular switch that is based on at least one signal indicative of a time changing heading of the vehicle to generate a signal indicative of this switch on a track database having information defining locations and orientations of switches and curves of a track system.

7.1 As previously mentioned (see above paragraphs 3. to 3.2), D1 (which was considered in the decision under appeal as anticipating the method according to claim 17 which corresponds to present claim 18) neither refers to switches, nor discloses a database storing locations and orientations of switches and curves of a track system. Nor are track identifiers referred to, or determined in D1.

8. The closest prior art with respect to method claim 18 is formed by D3 (figures 1 and 2), which discloses a method of determining a track identifier for a railway vehicle moving in a track system which comprises a step of providing signals representative of an approximate position of the vehicle.

8.1 In addition to the determining step mentioned above (paragraph 7), the steps of providing a computer with a track database having information defining locations and orientations of curves, switches and track identifiers of the track system, and with a signal indicative of a time changing heading of the vehicle for determining an event of said railway vehicle are the other features of claim 18 not disclosed in D3.

8.2 It is observed that, according to D3 (column 6, lines 1 to 8), neither GPS data nor dead reckoning data can indicate on which one of parallel tracks a railway vehicle is moving, and transponder indicators, track occupancies, switch position, train crew entries and manual dispatcher entries are also used to resolve these ambiguities.

9. Starting from D3 and having regard to the technical effects provided by the invention, the objective problem thus can be seen as providing a method for determining on which of a set of parallel and adjacent tracks the vehicle is travelling, without requiring the use of ground infrastructure (track circuits and/or transponders), as recited in the originally filed application (see column 2, lines 49 to 54, and column 3, lines 4 to 8 of the published application).

9.1 The solution to this problem is to provide the method steps identified in paragraph 8.1 above.

- 9.2 No disclosure, or suggestion, of such a solution can be found anywhere in the cited prior art documents, taken alone or in combination, because none of them discloses providing a computer with a database defining locations and orientations of switches and curves of a track system.
10. For the foregoing reasons, in the Board's judgement, the subject-matter of independent claims 1, 6 and 18 according to the present request is considered to be new and involve an inventive step within the meaning of Articles 54 and 56 EPC. The application as amended meets the requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to grant a patent in the following version:

description: pages 6 to 9, 12 and 14, as originally filed;
pages 2A, 3, 5, 10 and 13 filed with letter of 8 March 2001;
pages 2 with insert on page 2B, 11 and 15 filed with letter of 8 September 2004;
pages 1 and 4 filed with letter of 21 September 2004;
(for avoidance of doubt: page 2A follows insert page 2B)

claims: 1 to 20, filed with letter dated 21 September 2004;

drawing: as originally filed.

The Registrar:

The Chairman:

D. Sauter

W. J. L. Wheeler