BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 30 November 1993

Case Number: T 0380/92 - 3.2.1

Application Number: 86107280.9

Publication Number: 0205041

IPC: B60K 31/00, G05D 13/62

Language of the proceedings: EN

Title of invention:
Method and apparatus for vehicle speed control

Patentee:
Nissan Motor Co., Ltd.

Opponent:
Robert Bosch GmbH

Headword:
-

Relevant legal norms:
EPC Art. 56, 123(3)

Keyword:
"Extension of scope (no, after amendment)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0380/92 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 30 November 1993

Appellant: (Opponent)
Robert Bosch GmbH
Postfach 30 02 20
D - 70442 Stuttgart (DE)

Representative:
-

Respondent: (Proprietor of the patent)
Nissan Motor Co., Ltd.
2 Takara-cho, Kanagawa-ku
Yokohama-shi
Kanagawa-ken 221 (JP)

Representative:
Patentanwälte Grünecker, Kinkeldey,
Stockmair & Partner
Maximilianstraße 58
D - 80538 München (DE)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office of 23 January 1992 with written reasons posted on 20 February 1992 concerning maintenance of European patent No. 0 205 041 in amended form.**

Composition of the Board:

Chairman: F.A. Gumbel
Members: P. Alting van Geusau
B.J. Schachenmann

Summary of Facts and Submissions

I. European patent No. 0 205 041 was granted with effect from 17 November 1988 on the basis of European patent application No. 86 107 280.9 filed on 28 May 1986.

II. An opposition was filed against this patent on the ground of lack of inventive step in the light of the following documents:

D1: EP-A-0 071 702
D2: DE-A-3 416 369
D3: Rolf Isermann "Digitale Regelsysteme", pages 391 to 395, 413 and 421, Springer Verlag, Berlin-Heidelberg-New York 1977.

III. With its decision of 23 January 1992, with written reasons posted on 20 February 1992, the Opposition Division maintained the patent in amended form.

The Opposition Division held that the cited prior art did not suggest the features which distinguish the invention from known vehicle speed control systems, in particular the sampling of data during manual speed control for later use in the automatic mode of the vehicle speed control.

IV. The Appellant (Opponent) lodged an appeal against this decision on 27 April 1992 and paid the appeal fee on the same day. The Statement of Grounds of Appeal was filed on 24 June 1992.

The Appellant submitted in this Statement that the subject-matter of Claim 1 as maintained by the Opposition Division was extended in scope when compared to the granted Claim 1 and therefore did not meet the

requirements of Article 123(3) EPC. He further maintained the opinion that it lacked an inventive step in view of the prior art disclosed in the documents D2 and D3.

V. At oral proceedings, held on 30 November 1993, the Respondent presented a slightly amended set of claims, the independent Claims 1 and 5 read as follows:

"1. A method of controlling a vehicle having an internal combustion engine, an accelerator pedal (26), a throttle valve (24), and an actuator (22) responsive to a control signal (Sc) for moving said throttle valve (24);

said vehicle being travelling either in a manual mode where said accelerator pedal (26) is associated with said throttle valve (24) to move said throttle valve with movement of said accelerator pedal (26) or being travelling in an automatic control mode where said actuator (22) is associated with said throttle valve (24) to move said throttle valve;

comprising the steps of:

detecting a demand value of vehicle travelling speed;

generating a first electrical signal (V1) indicative of the speed of travelling of said vehicle;

generating a second electrical signal (V2) indicative of the degree of opening of said throttle valve (24);

characterized by

determining a throttle valve position value corresponding to said control signal (Sc) from a running characteristic in accordance with said detected demand value of vehicle travelling speed, thereby maintaining said vehicle at said demanded travelling speed when said vehicle is travelling in an automatic control mode;

while said vehicle is travelling in a manual mode, repeatedly sampling at time intervals actual values of said first and second electrical signals (V1, V2) representing actual values of vehicle travelling speed and throttle valve position, reading said sampled actual values *into a memory* to accumulate a number of sets of said actual values and to determine from said sampled values said running characteristic which defines throttle valve position in relation to vehicle travelling speed.

5. An apparatus for controlling a vehicle having an internal combustion engine, an accelerator pedal (26), and a throttle valve (24) for controlling the speed of rotation of said engine in a manual mode, where said accelerator pedal is associated with said throttle valve to move said throttle valve with movement of said accelerator pedal;

a control circuit (16) for generating a control signal (Sc) for an actuator (22) for controlling said throttle valve (24) to maintain said vehicle at a demanded travelling speed while said vehicle is travelling in an automatic control mode where said actuator is associated with said throttle valve to move said throttle valve;

a first signal source (20) for generating a first electrical signal indicative of the speed of travelling of said vehicle;

a second signal source (28) for generating a second electrical signal (V2) indicative of the degree of opening of said throttle valve (24);

said control circuit including means for detecting a demand value of vehicle travelling speed;

characterized by

said control circuit further including means for determining a throttle valve position value corresponding to said control signal (Sc) from a running characteristic in accordance with said detected demand value of vehicle travelling speed;

means included in said control circuit (16) for repeatedly sampling said first and second electrical signals (V1,V2), reading said sampled actual values of vehicle travelling speed and throttle valve position into a memory while said vehicle is travelling in a manual mode to accumulate a number of sets of said actual values, the actual values read into the memory determining said running characteristic which defines throttle valve position in relation to vehicle travelling speed."

VI. The Appellant requested that the decision under appeal be set aside and that the European patent be revoked.

In support of his request he relied essentially upon the following submissions:

As regards the question whether the subject-matter of the independent claims involves an inventive step, the prior art disclosed in D2 constitutes the most relevant prior art to be considered as the starting point for the assessment of inventive step.

Although this document does not explicitly refer to a cruise control with automatic actuation of a throttle valve, but rather refers to a diesel engine, the skilled person would immediately recognise from the remark in the last paragraph on page 12, that D2 also embraces control of a throttle valve of a petrol engine.

This known control system shows that, in order to take account of different operating conditions of the vehicle, for example whether the vehicle is going uphill or downhill, it is necessary to adapt the control parameters, in accordance with the actual running characteristic of the vehicle, the respective values being sampled by way of experiment. In D2 this is done by means of predetermined values of PID control data stored in a memory (ROM 10a in Figure 3) and read in accordance with sensed engine load and vehicle speed when the vehicle is travelling in an automatic control mode.

The skilled person would immediately recognise in practice that this known system is not sufficiently flexible in that only predetermined fixed data can be taken into account and that this data will no longer be reliable after a certain running period of the vehicle, e.g. due to the wear of vehicle components.

It is well known to the skilled person concerned, which is in the present case the control engineer rather than the automotive engineer, that in these circumstances an adaptive control would give better control results over the life of the vehicle and that therefore the ROM used in D2 should be replaced by a RAM for storing the actual running characteristic data. From D3, which on the pages 392, 393 and 413 refers to adaptive control circuits, the skilled person would derive the teaching that the data for the adaptive control could be

determined in an open loop configuration of the system, thus without the control being active. In case of a cruise control in accordance with D2 this would obviously mean that the running characteristic data to be stored in the RAM should be determined during manual control of the vehicle. Therefore, the skilled person would be led in an obvious manner to the subject-matter of the independent Claims of the amended patent.

VII. The Respondent requested that the appeal be dismissed and the patent be maintained with the documents (description, columns 1 to 7 with inserts replacing column 1, lines 5 to 11 and column 2, line 21 to column 3, line 9 and Claims 1 to 8) submitted at the oral proceedings and the drawings as granted.

In support of his request the Appellant relied essentially on the following arguments:

As regards inventive step either D1 or D2 may be considered to disclose the closest prior art. However neither these documents nor D3 disclose the essential features of Claims 1 and 5, e.g. that the running characteristic is derived from values accumulated during running of the vehicle under manual control, which is the case for the greater part of the vehicle's life.

In contrast thereto no adaptive control in accordance with D3, as referred to by the Appellant, is carried out in the invention because during the automatic speed control the running characteristic is not changed or manipulated.

Therefore the combination of the teachings of D2 and D3 would not lead to the present invention.

Many advantages result from the control in accordance with the patent. In particular, the control does not need any settings to be made in advance, because it takes account of the running characteristic of the vehicle as a whole, thus automatically including all the factors influencing the speed at the moment of switching to the automatic speed control mode, such as tyre dimensions, the actual engine condition, chassis and wheel conditions as well as the power consumption of accessories, for example, an air conditioner.

Therefore, in the Respondent's view, the method and apparatus as defined in Claims 1 and 5 did involve an inventive step.

Reasons for the Decision

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

2. *Amendments*

2.1 The independent Claims 1 and 5 now under consideration again comprise all the features of the granted Claim 1 and 5, respectively, so that the objection previously raised by the Appellant under Article 123(3) EPC is settled.

The independent Claim 1 and 5 in their preamble take account of the prior art disclosed in D1 and contain some additional clarification in respect of the presence of different modes of operation of the control (manual and automatic mode), but otherwise correspond to the granted versions.

The dependent Claims 2 to 4 and 6 to 8 correspond to granted Claims 2 to 4 and 6 to 8.

None of the claims give therefore rise to objections under Article 123(2) and (3) EPC.

2.2 The description was amended to take account of the amended claims and contains some corrections of obvious errors. These amendments do not give rise to objections under the EPC either.

3. *Prior art*

3.1 D1 discloses an electrical control system for speed control of a motor vehicle, comprising an accelerator pedal for manual control of a throttle valve and a throttle valve actuator responsive to a control signal from a controller for moving the throttle valve when the vehicle is travelling in the automatic mode in accordance with the preamble of Claims 1 and 5.

A demand value of the vehicle travelling speed is detected as well as signals indicative of the actual travelling speed, degree of throttle opening and the output of the control amplifier connected to the actuator.

At the beginning of the automatic vehicle speed control the throttle valve actuator is controlled to proceed to the last manually controlled setting. This is done by a control circuit comprising a comparator having as input signals the manually set position of the throttle valve and the output signal of the control amplifier. The output signal of the comparator is used as a stop signal for a counter (15), the resulting counting value of which is a measure of the amount of the opening of the throttle valve when initiating the automatic speed

control. A signal derived from the counted value is compared with the actual speed signal and the resulting difference signal used as the input signal for the control amplifier. In this manner a smooth transfer from the manual into the automatic control mode can be achieved (see page 5, lines 9 to 34).

3.2 D2 also concerns a system for speed control of a vehicle. Although there is no direct reference to a manual mode, in view of the fact that the system relates to control of vehicles such mode must be present for obvious reasons of safety and is therefore considered to be implicitly included in this prior art.

The vehicle speed control in the preferred embodiment described essentially with respect to Figure 1, which relates to a vehicle with a diesel engine, is carried out by comparing values of actual and desired vehicle speed and uses the resulting signal (D_3) as a first input signal of the control. The actual vehicle speed signal and a signal the value of which is a measure for the position of the injection pump control rod are further input values on the basis of which predetermined map values stored in a ROM are read and used in the calculation process for determining the control output signal so that the actual engine load occurring during automatic speed control of the vehicle is taken into account. Although expressly described for a vehicle having a diesel engine this control system may also be applied to a vehicle having a petrol engine and thus a throttle valve.

Hence, also the system disclosed in D2 comprises the combination of precharacterising features of Claims 1 and 5 of the amended patent.

3.3 D3 concerns a handbook on digital control systems. The pages of this book referred to by the Appellant disclose general considerations with respect to adaptive control and the structure of control circuits able to carry out adaptive control (see in particular page 393, Figure 23.2 a) and page 413 second paragraph).

4. *Novelty*

As can be derived from the above analysis of the relevant prior art, the subject-matter of the independent Claims 1 and 5 is novel, since none of these documents discloses a vehicle speed control which in the automatic mode determines the throttle valve position from a running characteristic defined by accumulated sets of values of throttle valve position and vehicle speed which are sampled in the manual mode.

Novelty of the subject-matter of the independent claims was in fact not contested by the Appellant.

5. *Inventive step*

5.1 The speed control systems disclosed in D1 and D2 are both not fully satisfactory under all driving circumstances in respect of compensation for changing running characteristics.

The control characteristic greatly depends on the vehicle running characteristic which not only differs substantially from vehicle to vehicle but is also dependent on a number of changing parameters such as tire size, tire pressure, the engine, wheel and chassis conditions and the operating condition of accessory units such as an air conditioner. These changing parameters cannot be taken into account by the known control systems disclosed in D1 and D2.

The problem underlying the subject-matter of the patent in suit is the provision of a vehicle speed control method (Claim 1) and apparatus (Claim 5) applicable commonly in various types of vehicle without any degradation in control stability and response speed (see column 2, lines 16 to 20 of the patent in suit).

This problem is solved by the features of the independent Claims 1 and 5, essentially by taking into account the running characteristic of the vehicle just before the moment of switching from the manual to the automatic mode when controlling the throttle valve position in the automatic mode of the speed control, this running characteristic being defined by accumulated sets of values of throttle valve position and vehicle speed sampled over a period when the vehicle was under manual control.

5.2 In the Board's opinion the skilled person would look in vain for teachings in the cited prior art documents towards a solution of the above stated problem as claimed in the amended patent.

D1 does not contain any reference to storing of data comparable with a running characteristic of the vehicle to be controlled.

In D2 control constants are derived from a setting device which determines the control constants from data stored in a ROM, which define these constants as a function of the actual vehicle speed and engine load, (which may be derived from the throttle valve position). However, the stored data is fixed and cannot be varied to compensate for changes in the running characteristic.

The revelations of D3 are quite general and are not considered to be of any help to the skilled person for solving the specific problem underlying the invention.

5.3 The Appellant considered it to be obvious to the skilled person to recognise the drawbacks of the system disclosed in D2, in particular because the running characteristic is stored in a ROM and thus in fact does not represent the actual state of operation of the vehicle. In view of developments in control and data storing techniques before the date of filing of the present patent the skilled person would, therefore,be led to consider using a RAM (instead of a ROM) and storing up to date control parameters which, when using the professional knowledge relating to adaptive control disclosed in D3, would immediately lead him to the subject-matter of the independent Claims 1 and 5.

In this respect it is observed that, in effect, D2 discloses already an adaptive control in which, during the automatic speed control, engine load is taken into account. Therefore the skilled person did not have any reason to apply further teachings of D3 to the system known from D2.

In case the system of D2 had been considered unsatisfactory the skilled person would have had a number of other possibilities available to select from in order to improve this known system in a manner to take account of further vehicle running parameters. It would, for example, have been obvious to provide the ROM with further data reflecting all kinds of operating conditions and to read them out in accordance with the sensed circumstances concerned.

D3 indeed refers to identification of the process to be controlled when self optimising adaptive control is

anticipated (see on page 393 the text in relation with Figure 23.2 a). However this documents essentially deals with adaptations during the automatic control of a process.

In the present case, however, no adaptive control is carried out during automatic speed control, but rather the speed control in accordance with the subject-matter of the independent Claims 1 and 5 is based on the actual running characteristic at the moment of switching to the automatic control mode and in so far the teachings of D3 cannot lead to the subject-matter claimed in the independent Claims 1 and 5 under consideration even if the skilled person would consider combining the teachings of D2 and D3.

It is further noted that the cited prior art does also not contain any reference or hint, be it direct or implicit, to the technical effects which are obtained by using the vehicle running characteristic derived before the automatic speed control is switched on. In particular, the flexibility of installation of the system in accordance with the patent in suit in any vehicle without that programming or other adaptations have to be carried out, is an aspect of substantial importance in the production of motor vehicles.

Although this technical aspect was also acknowledged by the Appellant to be advantageous over the prior art control systems, he argued that such advantages were the immediate result of the adaptive control taught by D3 when applied to the system of D2. However, as follows from the above considerations with respect to the disclosures of D2 and those of D3 relating to self optimising adaptive control the subject-matter of the independent Claims 1 and 5 is not an adaptive control in the sense of D3 and thus further modifications would

have been necessary to arrive at the invention claimed, for which no teachings whatsoever are derivable from the cited documents or which are obvious in view of the professional knowledge of the skilled person.

5.4 Summarising, in the Board's judgment, the proposed solution to the technical problem underlying the patent in suit defined in the independent Claims 1 and 5 involve an inventive step and therefore these claims as well as their dependent Claims 2 to 4 and 6 to 8, respectively, to particular embodiments of the invention in accordance with Rule 29(3) EPC, can form the basis for maintenance of the patent (Article 52(1) EPC).

6. The description and drawings are in agreement with the wording and scope of the current claims. Hence these documents are also suitable for maintenance of the patent in amended form.

Thus taking into account the amendments made by the Respondent, the patent and the invention to which it relates meet the requirements of the EPC and the patent as amended may be maintained in this form (Article 102(3) EPC).

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 with the order to maintain the patent with the documents (description and claims, see point VII of this decision)

submitted at the oral proceedings and the drawings as granted

The Registrar: The Chairman:

S. Fabiani F. Gumbel

2447.D