

Veröffentlichung im Amtsblatt	J/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non

Aktenzeichen / Case Number / N<sup>o</sup> du recours : T 65/87 - 3.2.2

Anmeldenummer / Filing No / N<sup>o</sup> de la demande : 81 110 856.2

Veröffentlichungs-Nr. / Publication No / N<sup>o</sup> de la publication : 0 056 165

Bezeichnung der Erfindung: Control apparatus for electrically controlled  
Title of invention: injection pump of Diesel engine  
Titre de l'invention :

Klassifikation / Classification / Classement : F02D 5/02 - F02M 51/04

### ENTSCHEIDUNG / DECISION

vom / of / du 18 September 1990

Anmelder / Applicant / Demandeur : Hitachi, Ltd.

Patentinhaber / Proprietor of the patent /  
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56 EPC

Schlagwort / Keyword / Mot clé: Inventive step (no) - Juxtaposition -

Leitsatz / Headnote / Sommaire

Europäisches  
Patentamt

Beschwerdekammern

European Patent  
Office

Boards of Appeal

Office européen  
des brevets

Chambres de recours



Case Number : T 65/87 - 3.2.2

D E C I S I O N  
of the Technical Board of Appeal  
of 18 September 1990

Appellant : Hitachi, Ltd.  
5-1, Marunouchi 1-chome  
Chiyoda-Ku Tokyo 100 (JP)

Representative : Beetz & Partner  
Patentanwälte  
Steindorfstrasse 10  
D-8000 München 22 (DE)

Decision under appeal : Decision of Examining Division 101  
of the European Patent Office  
dated 16 September 1986 refusing  
European patent application  
No. 81 110 856.2 pursuant to  
Article 97(1) EPC

Composition of the Board :

Chairman : G. Szabo  
Members : M. Noël  
M. Schar

## Summary of Facts and Submissions

- I. European patent application No. 81 110 856.2 filed on 30 December 1981 (publication No. 0 056 165) was refused by the decision of the Examining Division dated 16 September 1986.
- II. The reason for the refusal was that the subject-matter of Claim 1 filed with the letter of 23 June 1986 did not involve an inventive step in the light of the disclosure of the document
- (1) US-A-4 185 779
- and in view of the common general knowledge attributed to the person skilled in the art, as illustrated for example by the document
- (2) EP-A-0 017 107.
- III. On 24 November 1986, the Appellant lodged an appeal against this decision and paid the appeal fee simultaneously. The Statement of Grounds was submitted on 26 January 1987.
- IV. Oral proceedings took place on 18 September 1990, during which the patentability of amended Claims 1 to 6 (main request) filed together with the Statement of Grounds was discussed.

- V. Claim 1 of the main request, in which the letters (a) to (c) have been added by the Board for convenience to mark the three characterising paragraphs, reads as follows:

"A control apparatus for an electrically controlled injection pump (2) of a Diesel engine provided with an injection timing control solenoid valve (78) and an injection quantity control solenoid valve (80), comprising

- a timing signal generator circuit (240) for producing a timing signal synchronised to the rotation of the engine and
- a main controller circuit (260) for producing an injection timing control signal and an injection quantity control signal,

characterized in

- (a) that said solenoid valves (78, 80) have their opening durations controlled by said injection timing control signal and said injection quantity control signal in accordance with said timing signal and a first predetermined parameter representative of the operating state of the engine in a manner so that said pump (2) operates to supply a desired quantity of fuel to the engine in an optimal injection timing,
- (b) that in case of failure of said main controller circuit (260) an amount of fuel supply in emergency is controlled in accordance with a pulse width which is changed in accordance with a depressing degree of an acceleration pedal (310) and an injection timing is determined in accordance with a fixed pulse width, and

(c) that auxiliary means put into operation in emergency are provided comprising

- a first pulse signal generator circuit (320) for producing a first pulse signal having said fixed pulse width in response to said timing signal,
- a second pulse signal generator circuit (322) for producing a second pulse signal in response to said timing signal, said second pulse signal having a pulse width which is varied in accordance with said depressing degree of said acceleration pedal (310) and
- change-over switch means (312) which can be changed over between a first state and a second state, wherein in said first state of said change-over switch means (312) said control signals produced from said main controller circuit (260) are each supplied to a respective one of said solenoid valves (78, 80), while in said second state of said change-over switch means (312) said first pulse signal produced by said first pulse signal generator circuit (320) and said second pulse signal produced by said second pulse signal generator circuit (322) are supplied to said injection timing control solenoid valve (78) and to said injection quantity control solenoid valve (80) as an injection timing control signal and as an injection quantity control signal, respectively."

VI. At the end of oral proceedings, after deliberation of the Board, two auxiliary Claims 1 (auxiliary requests) were submitted. Both of them incorporated in their

characterising portions the subject-matter of Claims 3 and 4 in suit, the first auxiliary Claim 1, however, omitting feature (a) and the last portion of feature (c) ("change-over switch means ...").

These two auxiliary claims are not hereby reproduced since they were immediately refused by the Board for the reasons set out in Point 7. Accordingly, the present decision will refer to Claim 1 of the main request in the following.

VII. The Appellant submitted essentially that

- (i) the invention was to be seen in the provision of a control system for an electrically controlled fuel injection pump of a Diesel engine, including an auxiliary controller which is made operative in case of failure of the main controller for further assuring satisfactory operation of the injection pump.
- (ii) The means for the main controller and for the auxiliary controller were not merely duplicated in that in the auxiliary controller simpler electronic components such as mono-stable multivibrators had been used and also in that the injection timing was determined in accordance with a fixed pulse width. By such a simplification it was, therefore, to be assumed that a greater reliability could be expected, which was important for an emergency system.
- (iii) The document (1) disclosed a single control apparatus for a Diesel engine; however, no auxiliary means had been provided to be operable in case of failure of this controller.

- (iv) It was surprising that up until then (i.e. before the priority date of the application), no car driven by Diesel engines and equipped with the control system according to the present invention could be seen anywhere, which should be indicative of a long felt want.

VIII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or the auxiliary requests presented at the oral proceedings.

#### Reasons for the Decision

1. The appeal is admissible.
2. Formal aspects

Claim 1 in suit differs from the rejected Claim 1 by incorporation of the feature (b) in its characterising portion which represents, according to the Appellant, the crux of the invention.

In the Board's view, this paragraph is confined to introducing repetitions of features already contained in the last portion (c) of Claim 1, as already disclosed in the original specification. The subject-matter of Claim 1 does not, therefore, extend beyond the content of the application as originally filed (Article 123(2) EPC).

3. Closest prior art

Document (1) appears to be the closest prior art upon which Claim 1 is based, as was also agreed by the Appellant, since this document discloses not only the precharacterising portion of Claim 1, but also the

features according to the first portion (a) of the characterising part, that is to say all the features hereinafter referred to as the main controller (as individually considered).

Document (1) describes a control apparatus for an electrically controlled injection pump 78 of a Diesel engine provided with an injection timing control solenoid valve 80 and an injection quantity control solenoid valve 82. The control apparatus comprises a timing signal generator circuit for producing a timing signal TR synchronised to the rotation of the engine and a controller circuit 54 for producing an injection timing control signal T1 and an injection quantity control signal M1 (see Figures 1 and 9 and column 9, lines 20-56).

Document (1) further describes that said solenoid valves have their opening durations controlled by said injection timing and quantity control signals respectively (column 5, lines 50-60 and column 10, lines 40-42) in accordance with the timing signal TR (Figure 9) and a predetermined parameter S representative of the operating state of the engine (column 1, lines 23-28 and from column 3, line 62 to column 4, line 2) so that the injection pump operates to supply a desired quantity of fuel to the engine in an optimal injection timing (column 3, line 66 and column 9, line 1).

#### 4. Problem and solution

Only one control unit is provided in (1) so that if the controller fails, control of injection is no longer possible. Hence, the technical problem to be solved underlying the present application resides in the provision of means for assuring temporary continuation of controllable operability of the engine even in the event of failure in the controller.



According to features (b) and (c) of Claim 1, this problem is solved by the provision of an auxiliary controller (sub-controller) constituted by pulse signal generator circuits of a simplified circuit configuration (mono-stable multivibrators 320, 322) operable in the event of abnormal operation of the main controller.

A degree of simplification is provided here in that the injection timing pulses of the auxiliary controller have only a fixed pulse width while the injection timing pulses of the main controller use a pulse width which is varied in accordance with the depressing degree of the acceleration pedal.

In case of failure of the main controller the auxiliary controller is manually put into operation by means of a change-over switch.

5. Novelty

Novelty of the subject-matter of Claim 1 may be seen in the added means after consideration of points 3 and 4 above, although the main and auxiliary means are never used in combination. The question was not disputed in the impugned decision, so that this issue needs, in the Board's view, no further argument in the circumstances.

6. Inventive step

6.1 While in document (1) no auxiliary controller is present, timing pulses and quantity pulses are nevertheless produced, having the same characteristics as those produced by the auxiliary controller of the application.

As is clearly apparent from document (1), in particular column 9, lines 20-65 and Figure 9, a timing signal T1 having a fixed pulse width  $t_{p1}$  and a metering signal (quantity signal) M having a variable pulse width are produced by the electronic control unit 54. A throttle signal S, indicating of the desired engine speed (position of the acceleration pedal) is applied to the control unit 54 as indicated in Figure 1 for the purpose of computing the optimum timing, i.e. the injection advance and the quantity of each fuel injection (from column 3, line 62 to column 4, line 2). For the skilled person it is, therefore, clear that the quantity control signal M1 is varied in accordance with the depressing degree of the acceleration pedal and that signals have to be generated by well known generator circuits which form parts of the control unit. Therefore, document (1) also implicitly discloses simplified means similar to those constituting the auxiliary controller of the application as claimed, when considered separately.

- 6.2 Faced with the problem set in point 4 above, the person skilled in the art would, therefore, be logically drawn to provide in parallel to the main controller a second controller (emergency controller) operable by a change-over switch in case of failure of the main controller, because this alternative represents the simplest way and does not go beyond his normal design competence.

Since the controller described in document (1) would be suitable not only as main controller but also as auxiliary controller, i.e. with similar features or means as those recited in Claim 1, the contribution of the skilled person is, therefore, merely confined to providing in addition a manual change-over switch for selectively connecting the outputs of either of the operative controllers to the respective control valves.

The provision of such a common commutating means cannot support, in the Board's view, the presence of any inventive step.

- 6.3 As to the Appellant's argument under point V(ii), the Board is not satisfied that simple mono-stable multivibrators are more reliable than other electronic components such as those used for the main controller (Figure 9 of the application). Furthermore, multivibrators are commonly used for controllers of this type as illustrated in document (2), see in particular Figure 2, reference 16 and the waveform (d), Figure 7 at the output C of the multivibrator detailed in Figure 3.

Another simplification of the auxiliary controller would consist, in the Appellant's view, of producing timing pulses having fixed width (Figure 11, signal (B)) whereas those of the main controller have variable width (Figure 10, signal (c)). The Board cannot see in this feature any inventive contribution since it is already known from document (1) to produce timing pulses of a fixed duration and moreover it is also known that the operating parameters which determine the optimum timing for injection may vary independently of those parameters which determine the optimum quantity of fuel ((1), column 1, lines 13-22). Producing timing pulses of a fixed width, i.e. a cruder, less sophisticated version of the main controller which reduces somewhat the overall performance of the engine, represents no surprising or advantageous effect whatsoever. It stands to reason that such means are adequate for overcoming the temporary problem of emergency.

- 6.4 Further, in assessing the inventive step of a combination of features, consideration may only be given to features which in fact contribute, either independently or in

conjunction with one or more of the other features, to the solution of the problem (cf. T 37/82, OJ EPO 1984, 71).

In the present case, both the timing pulse and quantity pulse are variable in accordance with the position of the pedal (main controller) or, alternatively, only the quantity pulse is varied (auxiliary controller). The restriction of the latter is neither absolutely essential nor necessary for the solution of the technical problem, and represents only an obviously available simplification.

Further in this respect, since in the application both controllers are operated independently from each other and never simultaneously (either normal or emergency operations), the subject-matter of Claim 1 rather represents only a juxtaposition of two independent control means, i.e. without any functional relationship as would be the case in a true combination of features.

As each variant of said controllers is known per se, independently, from the same prior art document (1), bringing them together side by side in the same claim does not appear to be indicative of an inventive step.

- 6.5 As to the Appellant's argument under point VII (iv), the Board's opinion is that the time factor may be regarded as a factor in judging inventive step only if an important need has not been met over a long period of time. Where such a need did not manifestly exist, even obvious suggestions remain unused or unpublished for lack of real interest. In the present case, the Appellant failed to submit evidence that a long felt want for Diesel engines equipped with an auxiliary injection control system existed and that thereafter the claimed solution of the problem was appropriately successful on the market.

7. The two auxiliary requests submitted by the Appellant after deliberation by the Board have been refused because they have been filed at a very late stage and are not clearly allowable in the sense that their features were not likely to change the issue of these proceedings.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:

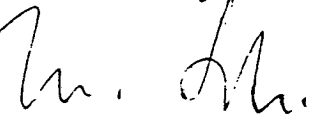
The Chairman:

  
S. Fabiani

  
G. Szabo



19. 10. 90



04161

24. 10. 90