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

Aktenzeichen / Case Number / N° du recours : T 310/89 - 3.5.1

Anmeldenummer / Filing No / N° de la demande : 84 302 684.0

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 124 330

Bezeichnung der Erfindung:
Title of invention:
Titre de l'invention : Improvements in or relating to fuel burner control systems

Klassifikation / Classification / Classement : F23N 1/02

## ENTSCHEIDUNG / DECISION

vom / of / du 24 April 1990

Anmelder / Applicant / Demandeur : Autoflame Engineering Ltd.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (no)"

**Leitsatz / Headnote / Sommaire**

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Case Number : T 310/89 - 3.5.1

# D E C I S I O N
## of the Technical Board of Appeal 3.5.1
## of 24 April 1990

Appellant : Autoflame Engineering Limited
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Decision under appeal : Decision of Examining Division 062 of the European Patent Office dated 9 December 1988 refusing European patent application No. 84 302 684.0 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W. Riewald
M. Lewenton

**Summary of Facts and Submissions**

I. European patent application No. 84 302 684.0 (publication No. 0 124 330) filed on 19/04/1984 and claiming a priority as from 21/04/1983, based on an application in the United Kingdom, was refused by decision of Examining Division 2.2.06.062, considered to be dated 09/12/1988.

II. That decision was based on the ground that the subject-matter of the then valid independent Claims 1 and 10 was not considered to involve an inventive step with respect to the prior art disclosed in the following documents :

D1: DE-A-3 010 147; and
D2: EP-A-0 050 840.

III. The Appellant (Applicant) lodged a Notice of Appeal against this decision on 17/02/1989. He had paid the relative fee on 15/02/1989. A Statement of Grounds was filed on 17/04/1989.

IV. In his Notice of Appeal the Appellant requested that the decision be set aside and a patent granted. He also filed a subsidiary request for Oral Proceedings.

On 13/11/1989 the Rapporteur issued a Communication in which he indicated the preliminary opinion of the Board that the subject-matter of the independent claims would appear to lack inventive step in view of D2 and D1.

The Appellant replied by filing two sets of thirteen claims each on 26/03/1990, accompanied by amended pages of the description. As he made clear in a fax received on the same day, which was confirmed by a letter received on

30/03/1990, the Appellant wished to base a main request on the set of claims marked "Main Request" with the description amended accordingly by the pages associated to that set. Subsidiarily the Appellant requested that a patent be granted on the basis of the other set of claims marked "Subsidiary Request" and the description amended by the associated pages.

Oral proceedings were held on 24/04/1990. During the Oral Proceedings, the Appellant confirmed his main and subsidiary requests.

The independent Claims 1 and 12 of the main request read as follows:

"1. A control system for a fuel burner, the system comprising a fuel supply control valve (3), an air supply control valve (2), a memory (102) for holding values of valve settings, and a processor (100), the system being operable in a commissioning mode to effect entry into the memory (102) of a respective combination of fuel valve setting and air valve setting for each of a plurality of values of an input signal representing a first variable, and being operable in a run mode to control the setting of a control valve (2 or 3) in accordance with data stored in the memory (102), characterized in that the control system is operable in the run mode to provide from the memory (102) both a respective value of fuel valve setting and a respective value of air valve setting according to the value of the input signal representing the first variable and to set both the fuel valve (3) and the air valve (2) according to the settings provided via the processor (100) from the memory (102), in that the processor (100) is permanently connected as part of the control system,

in that the respective combinations of air valve settings and fuel valve settings are arranged to be manually selected in the commissioning mode via the processor (100) under the control of an operator with the operator being able to adjust the valve settings via the processor to obtain the optimum combination, and in that each manually selected combination is entered into the memory (102) via the processor (100) before the next combination is selected."

"12. A method of commissioning and running a control system for a fuel burner, the system comprising a fuel supply control valve (3), an air supply control valve (2), a memory (102) for holding values of valve settings, and a processor (100), the method comprising the steps, during commissioning, of operating a burner, selecting a respective combination of air valve setting and fuel valve setting for each of a plurality of values of an input signal representing a first variable, and entering the selected combinations into the memory (102), and the method comprised the steps, during running, of operating the burner, providing an input signal to the processor (100) representing a first variable, and setting a control valve (2 or 3) in accordance with data stored in the memory (102), characterized in that during running the processor (100) provides from the memory (102) both a respective value of fuel valve setting and a respective value of air valve setting according to the value of the input signal representing the first variable, and sets both the fuel valve (3) and the air valve (2) according to the settings provided via the processor (100) from the memory (102), in that the processor (100) is permanently connected as part of the control system, in that the respective combinations of air valve settings and fuel valve settings are manually selected

during commissioning via the processor (100) under the control of an operator with the operator adjusting the valve settings via the processor (100) to obtain the optimum combination, and in that each manually selected combination is entered into the memory (102) via the processor (100) before the next combination is selected."

The independent Claim 1 of the auxiliary request differs from Claim 1 according to the main request only in that the passage "the setting of both the fuel valve (3) and the air valve (2) being arranged to take place after both setting values have been obtained from the memory with the actual settings of both the fuel valve and the air valve being checked a plurality of times each second," is added to Claim 1 according to the main request before "in that the processor is permanently connected as part of the control system". A corresponding addition is also included in independent method Claim 12 of the auxiliary request and in the corresponding passages of the description.

Claims 2-11 and 13 according to both the main request and the subsidiary request are identical and dependent upon Claims 1 and 12 respectively.

V. The Appellant submits the following arguments:

The essence of D2 is to teach a system for automatically commissioning a burner installation. Fully automatic commissioning as practiced in D2 does, however, not lead to optimal fuel:air ratios and thus is not satisfactory. The present invention aims at providing a superior controller. This is achieved by having the correct blend of automated and manual commissioning. It is submitted that adopting a manual commissioning system would be understood by a skilled person as a renunciation of all the alleged advantages of D2. Thus, starting from D2, it would not be

obvious to conceive a control system with manual commissioning, as is the invention.

D2 starts from a mechanical cam system and a system which can be interpreted as an electronic simulation of the mechanical cam system. One of the valves (e.g. the fuel valve) is controlled directly according to the heating requirement of the burner and acts as a master control valve for the other valve. The memory of the electronic system provides a control signal for the other valve only. D2 is only concerned with a new method of entering data in the memory but does not suggest that the operation of the system during running differs from the previously known systems. The sentence bridging pages 7 and 8 of D2, which is concerned with the control of the valves in the running mode, would thus be interpreted by a skilled person in view of this prior art as indicating that the system of D2 imitates the operation of the prior art systems. Furthermore, Figure 3 of D2, which illustrates commissioning of the system, shows two inputs to the memory while Figure 1, which illustrates the system in the running mode, shows only one output from the memory. Therefore, D2 does not disclose clearly that two command values are generated from a value pair in the memory. This feature, which distinguishes the invention from the prior art according to D2, should not be considered with hindsight in accordance with the published decision T 56/87 and paragraph 9.7(i) of Chapter IV, part C of the Guidelines for Examination.

It is admittedly well known that for each position of the fuel valve the air valve should be placed in a determined position in order to obtain efficient combustion. The fuel:air ratio curve giving the optimal positions of the air valve as a function of the positions of the fuel valve

is not linear, thereby complicating the problem of obtaining efficient combustion.

With the prior art systems according to both D1 and D2 with one of the valves (e.g. the fuel valve) acting as a master control valve, the other valve (the air valve) lags behind the master valve when the heating requirement changes, so that the fuel:air ratio is incorrect during adjustment of the valves. In any case the two valves move independently and thus the optimal fuel:air ratio curve is not followed during adjustment of the valves, which leads to inefficient operation of the burner. Furthermore in the prior art systems any sluggishness, sticking or wrong operation of the slave valve cannot be compensated by a corresponding adjustment of the master valve, which involves a safety risk during running of the system.

In the system of the invention the settings of both valves are controlled directly according to settings in the memory. The two valves can therefore be moved in unison with the correct fuel:air ratio being maintained at all times, also during adjustment of the settings of the valves.

Furthermore, as specified in the independent claims of the auxiliary request, the settings of both valves take place after both setting values have been obtained from the memory and the actual settings are checked a plurality of times each second. If, during movement of the valves, the result of a check indicates that one valve has not moved as quickly as the other then that other valve can be stopped until the valves are again in the correct relative positions, thereby increasing efficiency and safety during the operation of the burner.

The Appellant summarised his submissions in respect of the subsidiary request as follows :

(a) the skilled person would not eliminate the computer performing automatic commissioning in D2;

(b) there is no teaching in D2 to check the positions of the valves a plurality of times each second;

(c) to execute manually the commissioning is opposite to the teaching of D2;

(d) the programming of the memory is done differently in D2 than in the invention;

(e) with the system of D2 the valves are not moved in unison in the running mode and the optimal air:fuel curve is not followed during adjustment of the valves.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. The subject-matter specified in present independent Claims 1 and 12 according to both the main and subsidiary requests derives from the originally filed Claims 1 and 2 and the original description of Figures 1, 4a, 4b and 6. Present dependent claims derive from the originally filed Claims 3-12. The description has been amended to make it

consistent with the amended claims and to acknowledge further the relevant prior art. Thus the amendments made to the application appear to be supported by the original

content of the application and therefore do not contravene Article 123(2) EPC.

3. **Novelty**

3.1 Both D1 and D2 describe control systems for burners, which are operable either in a commissioning mode or a run mode and comprise a fuel supply control valve, an air supply control valve, a memory for holding respective combinations of fuel valve setting and air valve setting for each of a plurality of values of an input signal representing a first variable, and a processor which is used in the run mode to control the setting of a control valve in accordance with data stored in the memory.

Thus each of the cited documents discloses a control system and a method having the features specified in the pre-characterising clauses of the independent claims.

3.2 In the system of D2 the processor (1) is disconnected and replaced by a computer (20) in the commissioning mode. This computer runs the burner in a programmed way through its operative range, determines, by means of an exhaust probe, a suitable combination of air and fuel valve settings for each of a plurality of values of the input signal and stores the so determined combinations. When all the necessary combinations have been stored the computer (20) is connected to a programming device (25) which enters the combinations into the memory (8) of the control system. The system of D2 is designed to discharge the operator from the task of determining the combinations of air and fuel valve settings in the commissioning mode, thereby providing a substantially automatic commissioning.

Thus, the processor is not permanently connected as part of the control system and the valve settings in the commissioning mode are not manually selected.

3.3 The system of D1 (Figure 6) uses the processor (71) both for commissioning and running the system.

In the run mode the setting of the fuel valve (5) is determined directly from the input signal representing the first variable (temperature sensor 1), without intervention of the processor (71). The setting of the air valve (6) is derived from the data stored in the memory (72) by finding in the memory the particular setting of the air valve which is associated with the thus determined setting of the fuel valve. Thus the control system of D1 is operable in the run mode to provide from the memory the setting of only one of the valves and not of both valves.

3.4 It appears, therefore, that none of the cited documents discloses in combination the features specified in the independent claims either according to the main or the subsidiary request. The subject-matter specified in the independent claims is, therefore, deemed to be novel.

4. **Inventive step** (main request)

4.1 The Board regards the system disclosed in D2 as the prior art closest to the invention.

In addition to the features specified in the precharacterising clauses of the independent Claims 1 and 12, D2 indicates in the paragraph bridging pages 7 and 8 that in the run mode the processor (1) selects a pair of values from the memory (8) on the basis of the actual value of the input signal representing the first variable and produces a command from this selected pair of values.

According to a first possible interpretation of said paragraph the command would comprise only one setting for either the fuel or the air valve.

According to a second possible interpretation the command would comprise the settings for both control valves.

The Appellant has submitted that the skilled person would place the first interpretation on this ambiguous passage of D2. In that case the skilled person studying document D2 would have to devise how the setting for the other valve is determined. In the opinion of the Board, the skilled person, when facing that situation, would realise that the setting for the other valve is available in the processor since D2 states clearly that the pair of setting values is read from the memory by the processor. It would, therefore, be obvious to the skilled person to use the read pair of values for setting both valves.

Thus, even if the first interpretation were considered to be the most immediate to the skilled person, he would in any case arrive in an obvious manner at setting in the run mode both the fuel valve and the air valve according to the pair of values provided via the processor from the memory.

4.2 The remaining features specified in Claims 1 and 12 relate to the commissioning mode. These features are not disclosed in D2. They appear to be directed at simplifying the means necessary to commission the control system of D2.

Striving to reduce the complexity and thus cost of existing devices or parts thereof is a common endeavour of any skilled person. Thus the mere recognition of the above technical problem does not appear to involve a contribution to inventive step.

4.3 A control system substantially similar to the system of D2 but which does not use a separate computer for commissioning and thus is clearly simpler in this respect than the system of D2 is disclosed by the embodiment shown in Figures 6 and 7 of D1.

In that embodiment, in the commissioning mode, the setting of the fuel valve (5) is adjusted by an operator via the processor (71) and the setting of the air valve (6) is adjusted automatically under the control of combustion analysis equipment (51). Hereafter, when the operator presses a push-button (63), the selected combination of settings as indicated by position indicating potentiometers (7,11) is entered into the memory (72) before the next combination is selected by the operator.

Thus, in the opinion of the Board, it would be obvious to a skilled person, in order to simplify the commissioning means, to replace the commissioning means used in D2 by the one known from D1.

In view of the passage bridging pages 13 and 14 of D1, the skilled person would then clearly recognise that optimum flame and thus combustion can also be obtained if, during commissioning, the automatic adjustment of the air valve setting is replaced by a manual adjustment. Thus a further obvious simplification of the commissioning means would be to use a manual adjustment of the air valve during commissioning. It is then clear to the skilled person that, in the embodiment shown in Figures 6 and 7, this manual adjustment of the air valve setting should be made by the operator via the processor since this is already the case for the adjustment of the fuel valve setting. This appears to be confirmed by Claim 5 of D1 which states that the air and fuel valve settings can both be adjusted manually.

4.4 In this manner, the skilled person would apparently arrive in an obvious manner to the subject-matter of Claims 1 and 12.

4.5 The arguments brought forward by the Appellant are not convincing:

Although D2 does not clearly disclose that, in the run mode, both settings for the fuel and air valves are derived from the data stored in the memory, this appears nevertheless to be obvious to the skilled person as explained in paragraph 4.1 above. In this respect the Board has given to D2 the interpretation which was more remote from the invention. Thus the disclosure of D2 has not been considered with hindsight in agreement with decision T 56/87 and the cited passage of the Guidelines for Examination.

The Board has taken the run mode of the system of D2 as the starting point of its reasoning. Commissioning and running the system of D2 are clearly two distinct and independent operations. Thus, in the opinion of the Board, although the teaching of D2 appears indeed to be directed at providing fully automatic commissioning, the skilled person would nevertheless recognise without difficulty that commissioning can be executed differently than specifically set out in D2.

4.6 For these reasons the Board considers that the subject-matter specified in the independent Claims 1 and 12 of the main request is obvious to the skilled person and thus does not involve an inventive step.

5. **Inventive step** (subsidiary request)

5.1 The only additional feature specified in independent Claims 1 and 12 of the auxiliary request is that, in the run mode, the setting of both the fuel valve and the air valve is arranged to take place after both setting values have been obtained from the memory with the actual settings of both the fuel valve and the air valve being checked a plurality of times each second.

5.2 As explained above in paragraph 4.1, it appears obvious from D2 to set both valves according to a pair of values obtained from the memory. In the paragraph bridging pages 7 and 8 and on Figure 1, D2 indicates further that the actual settings of the fuel and air valves (15,13) are fed back to respective "command converters" (10,9) which provide corresponding feedback signals to the processor (1). It appears therefore that, in the system of D2, the actual settings of both valves are checked by the processor. To do this a plurality of times each second by means of the processor appears to be obvious in view of the processing speed of such processors.

5.3 The further arguments brought forward by the Appellant in respect of this additional feature are not convincing:

As appears from the originally filed description, page 14, line 8 to page 17, line 1, the system of the invention firstly determines the required fuel valve setting on the basis of the deviation from the first variable, then selects in the memory the corresponding air valve setting and finally applies the pair of settings to control the positions of the fuel and air valves in a feedback arrangement in which the positions of the valves are read by means of associated potentiometers and checked eight times per second. The movement of the valves 2 and 3 from first to second set values is effected by servomotors 4 and

5 respectively, responding to their associated feedback circuits. Thus, during adjustment of the valves to a new pair of set values, the two valves move independently. No specific means are disclosed in the application which would ensure a movement in unison of the two valves in the sense of always maintaining the correct fuel:air ratio in this case. Therefore, the system, as described originally, would not be able to always follow the optimal fuel:air ratio curve during movement of the valves. The arguments of the Appellant based on moving the valves in unison can, therefore, be disregarded as they are not consistent with the original disclosure.

5.4 Thus the Board considers that the subject-matter of Claims 1 and 12 of the subsidiary request does not involve an inventive step.

6. For these reasons the Board has come to the conclusion that the independent claims of the main and subsidiary requests are not allowable for lack of inventive step. The dependent claims fall with the unallowable independent claims.

**Order**

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

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana P.K.J. van den Berg