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Datasheet for the decision of 31 August 2018

Case Number: T 0588/15 - 3.2.04

Application Number: 07001010.3

Publication Number: 1816327

IPC: F02C9/54, F02C6/08, F02C9/52

Language of the proceedings: EN

Title of invention:
Control method and control system of gas turbine

Patent Proprietor:
Mitsubishi Hitachi Power Systems, Ltd.

Opponent:
Siemens Aktiengesellschaft

Headword:

Relevant legal provisions:
EPC Art. 123(2), 123(3)
RPBA Art. 12(4)

Keyword:
Amendments - extension beyond the content of the application as filed (main and auxiliary requests 1 to 8 yes) - broadening of claim (auxiliary requests 9 and 10 yes)
Late-filed auxiliary requests - admitted (no)

Decisions cited:
G 0002/10, T 0351/14, T 0183/09

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 0588/15 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 31 August 2018

Appellant: (Patent Proprietor)	Mitsubishi Hitachi Power Systems, Ltd. 3-1, Minatomirai 3-chome, Nishi-ku, Yokohama 220-8401 (JP)
Representative:	MERH-IP Matias Erny Reichl Hoffmann Patentanwälte PartG mbB Paul-Heyse-Strasse 29 80336 München (DE)
Respondent: (Opponent)	Siemens Aktiengesellschaft Werner-von-Siemens-Straße 1 80333 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 20 January 2015 revoking European patent No. 1816327 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman A. de Vries
Members: J. Wright
W. Van der Eijk

Summary of Facts and Submissions

I. The appellant-proprietor lodged an appeal, received 19 March 2015 against the decision of the Opposition Division posted on 20 January 2015 revoking European patent No. 1816327 pursuant to Article 101(3)(b) EPC. The appeal fee was paid at the same time. Their statement setting out the grounds of appeal was filed on 29 May 2015.

II. Opposition was based, *inter alia*, on added subject matter (Article 100(c) EPC, with Article 123(2) EPC).

III. The Opposition Division held that the above opposition ground (added subject matter) prejudiced the maintenance of the patent, while amendments made to the claims also did not meet the requirements of Article 123(2) EPC.

IV. Oral proceedings were duly held before the Board on 31 August 2018.

The appellant-proprietor requests that the decision under appeal be set aside and the patent be maintained in an amended form, according to the claims of a main request, or one of auxiliary requests 1 to 9, all filed with letter of 31 July 2018, or according to one of auxiliary requests 10 and 11, filed during the oral proceedings before the Board on 31 August 2018.

The respondent-opponent requests that the appeal be dismissed.

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

"A control method of a gas turbine comprising a compressor (1) for compressing air as a working fluid and producing compressed air (13), a combustor (3) for burning the compressed air from said compressor (1) and liquid fuel, and a turbine (2) driven by combustion gas (14) discharged from said combustor (3), the control method comprising the steps of:

mounting a fuel injector (9) which injects the liquid fuel in a pressure atomizing manner in said combustor (3); and characterized by

reducing a flow rate of the working fluid for said compressor (1) in a part load region of said gas turbine to be smaller than a reference flow rate of the working fluid for said compressor (1), said reference flow rate being set such that performance of said compressor is maximized and that in said part load region neither surging nor icing is caused in the compressor (1) and said reference flow rate being set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine".

VI. Claim 1 of the auxiliary requests is amended *inter alia* in that the last feature of claim 1 of the main request: "said reference flow rate being set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine" is amended as follows (with emphasis of additions in underline and deletions in strike-through, added by the Board):

Auxiliary request 1:

"said reference flow rate being set so as to increase the fuel air ratio in said combustor (3), by increasing a load while the flow rate of the working fluid for

said compressor (1) is kept at a predefined value, in said part load region of said gas turbine".

Auxiliary request 2:

"said reference flow rate being set so as to increase the fuel air ratio in said combustor (3), by increasing a load while an opening of an inlet guide vane (17) is kept at a predefined opening (V0), in said part load region of said gas turbine".

Auxiliary requests 3 to 6: the feature is unamended

Auxiliary request 7

"said reference flow rate being set in dependence on the increasing amount of fuel supplied to the combustor so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine"

Auxiliary request 8:
"said ~~reference~~ flow rate of the working fluid is ~~being~~ set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine".

Auxiliary request 9:
The feature is entirely deleted.

Auxiliary request 10:

"a curve of said reference flow rate, which the curve of the working fluid follows at a lower level in a region up to 50% load, is ~~being~~ set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine"

Auxiliary request 11:

"a curve of said reference flow rate, which the curve of the working fluid follows at a lower level in a region from 0% load up to 50% load during start up of the gas turbine, is ~~being~~ set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine"

VII. The appellant-proprietor argued as follows:

The feature g of the main request "reference flow rate being set so as to increase the fuel air ratio in said combustor (3) ..." can be interpreted in two ways, both are originally disclosed.

The first interpretation is that the feature merely confirms the central idea of the invention - that is to increase the fuel air ratio in the part load region relative to the comparative [reference] example. Thus, the feature g really means that the flow rate is set so as to increase the fuel air ratio in the combustor relative to the fuel to air ratio achieved with the reference flow rate.

The second interpretation is that feature g expresses that the fuel air ratio in a combustor always increases in the part load region of a gas turbine, with respect to increasing load. The flow rate of the working fluid (air) must be set so as to achieve this upward trend in fuel to air ratio. Therefore, feature g merely defines what is implicitly always true in any gas turbine.

Since feature g is devoid of technical meaning or significance it does not limit the scope of the claim,

is redundant and can be ignored, similar to the case T351/14. Therefore it does not add subject matter extending beyond the application as filed.

The above considerations also apply to auxiliary requests 3 to 6. The auxiliary requests 1, 2 and 7 define how the reference flow rate is set in greater detail.

Given that, according to this second interpretation, feature g is redundant and poses no technical limitation on the claim it can equally well be deleted without extending the scope of protection conferred by the patent. Therefore auxiliary requests 8 and 9, which in effect delete feature g, meet the requirements of Article 123(3) EPC.

Auxiliary requests 10 and 11 more precisely explain how the reference flow rate is set, in particular with regard to its curve and how the actual flow rate follows this curve. They are clearly allowable, inter alia because they do not add subject matter, so they should be admitted into the proceedings.

VIII. The respondent-opponent argued as follows:

It is true that the fuel to air ratio in a combustor generally increases in the part load region of a gas turbine, with respect to increasing load.

However, this does not mean that the flow rate of the the working fluid (air) is always set to achieve this increase in fuel to air ratio. Instead the fuel input can be set for example. Setting the reference flow rate to achieve an increase in fuel to air ratio with increasing load according to feature g has no original

disclosure in the application as filed. Therefore feature g of the main request adds subject matter. The same applies to auxiliary requests 1 to 7.

Because feature g limits the claim it is not a redundant feature with no technical meaning. Since the feature was in claim 1 as granted, it cannot be deleted, as has been done in auxiliary requests 8 and 9, without infringing against Article 123(3) EPC.

Auxiliary requests 10 and 11 are very late filed. Furthermore they also contain feature g so are not clearly allowable. Therefore they should not be admitted into the proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The patent concerns a method of operating a gas turbine (see published patent specification, paragraph [0001] and claim 1 in all its versions). The method aims to reduce emission of carbonaceous particular matter (soot) in a part-load operating region, that is as load is first applied to the turbine (specification, paragraphs [0007] and [0013]). The basic idea of the invention is presented as being to reduce flow rate of working fluid [air] in a part load region compared to the flow rate that would need to be set in order to have neither surging nor icing in the compressor and maximum compressor performance (specification paragraph [0010] and column 5, lines 10 to 15). This (see column 6, lines 3 to 10, figure 3) increases the fuel air

ratio in a part load region of a gas turbine operation which raises the operating temperature. At this higher temperature carbonaceous particulate material is burnt out (see specification, paragraphs [0027] and [0033] for example).

3. Main request, interpretation of feature g

3.1 Claim 1 of the main request (and the patent as granted) has been amended vis-à-vis originally filed claim 1, by adding the feature "said reference flow rate being set so as to increase the fuel air ratio in said combustor (3) in said part load region of said gas turbine." This feature is referred to by the Board in the following as feature g. In the decision under appeal, the Opposition Division (which referred to the feature as feature h) held that this amendment added subject-matter (see impugned decision, section 3.1.2).

3.2 How the skilled person interprets feature g therefore plays a pivotal role in deciding whether or not it adds subject matter.

The Board acknowledges that feature g is not ideally formulated. In particular, the feature tells the skilled person to set a reference flow rate of the working fluid [air] in the part load region so that the fuel to air ratio increases, but it does not define relative to what the fuel to air ratio should increase.

3.3 The skilled person, with their mind willing to understand, always seeks a technically meaningful interpretation of the claim. Where they experience difficulties they will read the claim in the context of the whole specification, including the claims, description and drawings.

3.4 In the present case, the skilled person will first need to find a meaningful interpretation of the concept of the "reference flow rate" in the light of the description, where the term itself is not actually used. Claim 1 first uses the term in a feature summarised as follows: reducing a flow rate of the compressor's working fluid in a part load region to be smaller than a reference flow rate whereby the reference flow rate is set such that performance of said compressor is maximized and so that neither surging nor icing is caused.

The description of the first detailed embodiment (see paragraphs [0023] to [0027] with figure 3) explains operation of the compressor according to the invention with reference to a comparative example. In figure 3 a broken line represents the comparative example and a solid line the first embodiment. In the turbine part-load region (see figure 3, first graph, 0 to 80% load), the dashed (comparative example) line shows the opening of the inlet guide vane to be held constant at V0. This opening directly corresponds to a certain airflow rate (figure 3, second graph, dashed line). According to the description (see column 5, lines 7 to 15), the opening V0 represents an opening prescribed such that, in this part load region, "neither surging nor icing is caused in the compressor and the performance of the compressor is maximized...as well". Thus the "reference flow rate" of present claim 1, defined, inter alia, as meeting the same conditions (no surging, no icing and maximum performance), can but be the constant air flow rate of the "comparative example" corresponding to the vane opening V0 of figure 3 (see first and second graphs).

3.5 Armed with this knowledge, the skilled person will interpret feature g. The appellant-proprietor has proposed two ways to do so.

3.5.1 The Board is not convinced that the skilled person would interpret it according to the first proposal (in the part-load region, the combustor fuel to air ratio should be increased, and the reference flow rate must be set accordingly). This reading amounts to feature g only saying that the flow rate is set to increase fuel to air ratio, in other words it simply ignores the word "reference".

The skilled person would however not do this because feature g defines how the *reference* flow rate is set, rather than any other flow rate.

3.5.2 Rather, in the Board's view, the skilled person would interpret feature g according to the second interpretation proposed by the appellant proprietor (the reference flow rate being set to increase the fuel air ratio with increasing load).

It is not in dispute that in a part load operating region of a gas turbine, the fuel to air ratio normally increases with increasing load. This is also the case in the patent (see the progression of the fuel air ratio shown in figure 3, third graph). Thus, the appellant-proprietor's second interpretation of feature g (reference flow rate set to increase the fuel air ratio with respect to increasing load in the part load region) would simply mean that, when carrying out the invention, the skilled person must set the reference flow rate in a particular way so as to achieve the normal increase of fuel to air ratio with increasing load.

In the Board's view, this interpretation makes technical sense, since to achieve a certain fuel to air ratio either one or both of the the air flow and the fuel flow must be set.

Read so, feature g is logical and technically meaningful. Therefore, in this respect the case differs from that of T 351/14 (see points 4.1 and 4.2). The Board in that case interpreted a claim as not covering an embodiment which could theoretically be read onto a feature but which required a cigarette to have a diameter of 1 mm, which the Board held to make no technical sense.

3.6 The Board concludes that the skilled person would interpret feature g as defining the reference flow rate being set to increase the fuel to air ratio with increasing load.

4. Main request, claim 1, added subject matter

4.1 Both parties acknowledge that feature g has no literal basis in the original documents as filed. The issue to be decided is whether the skilled person would derive the feature, as interpreted above, "directly and unambiguously using common general knowledge", from the whole of the documents filed, that is the description, claims and drawings read as a whole (see e.g. G0002/10 OJ 2012, 376, reasons 4.3, first paragraph). In the Board's opinion, the skilled person would not.

4.2 By definition a fuel to air ratio depends on how much fuel and how much air is input to the gas turbine. However, in the Board's opinion it is not implicitly always the case that the air flow must be set to meet a

given fuel to air ratio. As the respondent-proprietor has argued, in the case of a fuel to air ratio that increases with increasing load in the part load region, this could for example be achieved by setting the amount of air input (as in feature g) or by setting the amount of fuel input to increase or by setting the air input to increase whilst setting the fuel to increase faster. Thus, rather than feature g being redundant in the sense of defining something which is always true, it limits claim 1 by defining just one of several possibilities of achieving an increase in fuel to air ration with increasing load for a reference operating condition.

4.3 In the Board's view there is no original disclosure of setting the reference (air) flow rate to increase the fuel air ratio [with increasing load].

As in the published patent specification (see above, section 3.4) the description of the application as published (to which reference will be made in the following) describes a "comparative example" which is the same as the "reference flow rate" (see paragraphs [0021] to [0025] with figure 3, second graph, dashed line). This comparative example flow rate corresponds to a certain opening V0 of the inlet vane (see page 4, lines 7 to 10, figure 3, first graph). According to the description (see page 4, lines 7 to 10), this vane opening V0, with its associated comparative example [reference] flow rate, is prescribed, in other words set, such that "in a part load region, neither surging nor icing is caused in the compressor 1 and the performance of the compressor 1 is maximized ... as well". Thus, rather than the reference flow rate being set to realise a certain fuel air ratio as feature g requires, it is originally disclosed as being set

according to different criteria (no surging no icing and maximum performance). This concept is repeated in paragraph [0032].

4.4 Moreover, although the description does not explicitly say how the skilled person should achieve the required increase in fuel to air ratio with increasing load in the part load region, the Board notes that in this region the air flow rate is constant (figure 3, second graph). The only other region in which the air flow rate (and guide vane opening) is kept constant is in the turbine speed up zone. There (see page 4, lines 2 to 6), it is disclosed to increase the flow rate of fuel supplied in order to increase the fuel air ratio, in other words the fuel supply is set to increase the fuel to air ratio, not the air flow rate.

Thus, in the Board's view, at most the application as filed hints at setting the fuel flow rate in order to increase the fuel to air ratio, but it does not directly and unambiguously disclose the reference [air] flow rate being set so as to increase the fuel air ratio in the combustor in the part load region.

Furthermore, since, as already explained, feature g does not merely define what is inevitably, thus implicitly, true for all methods of controlling a gas turbine but poses a new technical limitation on the invention as claimed, the Board concludes that the amendment adds subject matter extending beyond the application as filed, Article 123(2) EPC. For these reasons the main request must fail.

5. Auxiliary requests 1 and 2

Claim 1 of auxiliary requests 1 and 2 also contain feature g but amend it by respectively adding that the flow rate is kept constant (first auxiliary request) or that the inlet guide vane is kept at a predefined opening V0 (second auxiliary request).

These additions respectively define what happens to the reference flow rate and vane opening in the part load region (see figure 3, they remain constant). However, this does not alter the fact that feature g defines the new information that the reference flow rate must be set so as to increase the fuel air ratio in the combustor. In other words, having the claim define the actual course of the flow rate/vane opening as originally disclosed, does not change the fact that the claim still includes the new further requirement of the flow rate being set so as to increase the fuel air ratio in the combustor which was not originally disclosed. Therefore claim 1 of the first and second auxiliary requests add subject matter for the same reasons as apply for the main request.

6. Auxiliary requests 3 to 6

Feature g is unamended in claim 1 of these requests. Therefore they must fail on added subject matter for the same reasons as apply to the main request.

7. Auxiliary request 7

Auxiliary request 7 amends feature g to add the requirement that the reference flow rate is set "in dependence on the increasing amount of fuel supplied to the combustor so as to increase the fuel air ratio..."

Feature g as amended here thus adds the information that the fuel is to be supplied to the combustor in increasing amount [with increasing load]. However, just as with the first and second auxiliary requests, this additional information does not change the new subject matter of feature g that is not originally disclosed, namely that the reference flow rate is set so as to increase the fuel air ratio. Therefore, just as for the main request, claim 1 of this request adds subject matter extending beyond the application as filed.

8. Auxiliary requests 8 and 9

8.1 Auxiliary request 8 amends feature g by deleting the word "reference", so that the feature reads (with deletion emphasised by the Board) "the ~~reference~~ flow rate of the working fluid is set so as to increase the fuel air ratio...". The deletion removes the new requirement introduced by feature g, which was also present in claim 1 as granted, that the *reference* flow rate is set...to increase the fuel air ratio. This amendment therefore boils down to the deletion of feature g as it was present in granted claim 1. Since, as already explained (see above point 3.5), the feature has technical meaning and constitutes a technical limitation on the scope of protection conferred by the claim, its removal extends the protection conferred by the patent. Therefore, claim 1 of this request does not meet the requirements of Article 123(3) EPC.

8.2 Claim 1 of auxiliary request 9 deletes feature g in its entirety. Therefore, for the same reasons as apply to auxiliary request 8, claim 1 of auxiliary request 9 extends the protection conferred beyond claim 1 as granted so does not meet the requirements of Article 123(3) EPC.

9. For the above reasons, leaving aside the question of admissibility of the main request and auxiliary requests 1 to 9, the Board concludes that none of these requests are allowable.

10. Auxiliary requests 10 and 11, admissibility

10.1 Auxiliary requests 10 and 11 were filed at the oral proceedings before the Board. The requests thus amount to an amendment to the Appellant-proprietor's case in the sense of Article 13 of the Rules of Procedure of the Boards of Appeal (RPBA). Under paragraph (1) of that article the Board exercises discretion in admitting such amendments in view of, inter alia, complexity of the subject-matter, the state of the proceedings and the need for procedural economy. Furthermore, under Article 13(3) RPBA any amendments sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which the Board or the parties cannot reasonably be expected to deal with without an adjournment.

10.2 An approach frequently adopted by the Boards when exercising their discretion in dealing with an amendment filed during oral proceedings can be summarised as follows:

Unless good reasons exist for filing the amendment so late in the proceedings - for example if it is occasioned by developments in the proceedings - it will be admitted only if it does not extend the scope or framework of discussion as determined by the decision under appeal and the statement of the grounds of appeal, and is moreover clearly allowable, see Case Law

of the Boards of Appeal, 8th edition, 2016 (CLBA) IV.E. 4.2.6 b) and the case law cited therein.

In accordance with established jurisprudence, amended claims are clearly allowable if the Board can quickly ascertain that they overcome all outstanding issues without raising new ones, see for example T 183/09, reasons 4.

10.3 In its communication of 4 May 2018 the Board informed the parties of the critical issues to be discussed, *inter alia* with respect to added subject matter of feature g. The Board sees no justification for waiting until the day of the oral proceedings to file additional auxiliary requests, considered by the appellant-proprietor to address the concerns of the Board.

10.4 Moreover, claim 1 of these requests are, in the Board's opinion, not clearly allowable.

In both requests, the subject matter of feature g is amended *inter alia* by changing the "said reference flow rate" to "a curve of said reference flow rate". In the Board's view, since, as explained for the main request, setting the reference flow rate so as to increase fuel air ratio adds subject matter, then setting its curve to do the same adds subject matter for the same reasons. The remaining amendments merely add details as to how the curve of the working fluid follows the reference flow rate. Therefore, auxiliary requests 10 and 11 are not clearly allowable.

10.5 Accordingly, the Board decided not to admit auxiliary requests 10 and 11 into the proceedings pursuant to Articles 13(1) and 13(3) RPBA with Article 114 (2) EPC.

11. The Board concludes that, since the main request and auxiliary requests 1 to 9 are not allowable and the remaining requests 10 and 11 are not admitted into the proceedings, the Board can but dismiss the appeal.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated