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 1 October 1997

Case Number: T 0859/95 - 3.2.3

Application Number: 90309090.0

Publication Number: 0413611

IPC: F23C 11/02, B01J 8/38

Language of the proceedings: EN

Title of invention:
Method and system for controlling the backflow sealing efficiency and recycle rate in fluidized bed reactors

Patentee:
FOSTER WHEELER ENERGY CORPORATION

Opponent:
Bayer AG
Deutsche Babcock Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"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 0859/95 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 1 October 1997

Appellant: (Opponent)
Bayer AG, Leverkusen
Konzernverwaltung RP
Patente Konzern
Bayerwerk
D-51368 Leverkusen (DE)

Other party: (Opponent)
Deutsche Babcock Aktiengesellschaft
D-46041 Oberhausen (DE)

Respondent: (Proprietor of the patent)
FOSTER WHEELER ENERGY CORPORATION
Perryville Corporate Park
Clinton
New Jersey 08809-4000 (US)

Representative:
Rackham, Anthony Charles
Lloyd Wise, Tregear & Co.
Commonwealth House
1-19 New Oxford Street
London WC1A 1LW (GB)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 29 September 1995 rejecting the opposition filed against European patent No. 0 413 611 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: C. T. Wilson
Members: H. Andrae
L. C. Mancini

Summary of Facts and Submissions

I. European patent application No. 90 309 090.0, filed on 20 August 1990 and published on 20 February 1991 under publication No. 0 413 611, was granted on 19 January 1994.

The independent Claims 1 and 4 read as follows:

"1. A fluidised bed combustion system including separating means (18) for receiving a mixture of flue gases and entrained particulate material from a fluidised bed and separating the entrained particulate material from the flue gases, means (22) for passing the separated flue gases from the separating means (18) to a heat recovery unit (24), a dipleg (28) for passing the separated material from the separating means (18) to a seal vessel (30), means for passing the separated material from the seal vessel (30) back to the fluidised bed, and means (42,44) for introducing air or gas to the seal vessel (30) for fluidising the separated material in the seal vessel (30) to seal against the backflow of the separated material from the fluidised bed through the dipleg (28) and back to the separating means (18), characterised in that the air introducing means (42, 44) comprise a first conduit (42) for introducing air or gas into the seal vessel (30) in a path aligned with the flow path of the separated material from the dipleg (28), and a second conduit (44) for introducing air or gas into an area of the seal vessel (30) surrounding the flow path of air or gas from the said first conduit (42), and in that means (46, 48) are provided for independently regulating the air or gas flow into the first and second conduits (42, 44) to control the rate of separated material passed back to the fluidised bed (10)."

"4. A method of controlling a fluidised bed combustion system comprising the steps of receiving a mixture of flue gases and entrained particulate material from a fluidised bed, separating the entrained particulate material from the flue gases, passing the separated flue gases to a heat recovery unit, passing the separated material to a seal vessel (30), passing the separated material from the seal vessel (30) back to the fluidised bed, and introducing air or gas to the seal vessel (30) for fluidising the separated material in the seal vessel (30) to seal against the backflow of the separated material, characterised in that air or gas is introduced into the seal vessel (30) in a path aligned with the flow path of the separated material into the seal vessel, air or gas is also introduced into an area of the seal vessel (30) surrounding the said path aligned with the flow path of the separated material into the seal vessel, and independently regulating the two air or gas flows into the seal vessel (30) to control the rate of passage of the separated material back to the fluidised bed."

II. The patent was opposed by the Appellant (Opponent 1) and the Opponent 2 who both requested revocation of the patent on the ground of Article 100(a) EPC, in particular because of the absence of inventive step.

The oppositions were supported by the following documents:

(E1) EP-A-0 290 213

(E2) M. Vogt: "Dampferzeuger mit integrierter Wirbelschichtfeuerung in einem Industriekraftwerk" VGB Kraftwerkstechnik, Heft 5, May 1996, pages 458 to 462

(E3) F. Gestermann et al.: "Inbetriebnahme und erste Betriebsergebnisse des Dampferzeugers mit zirkulierender Wirbelschichtfeuerung bei Bayer AG, Leverkusen" VGB Kraftwerkstechnik, Heft 7, July 1989, pages 702 to 708.

III. By decision dated 29 September 1995 the Opposition Division rejected the oppositions.

The Opposition Division held that the documents cited in the opposition proceedings did not lead in an obvious manner, either individually or in combination, to the teaching of Claims 1 and 4, respectively.

IV. On 12 October 1995 the Appellant lodged an appeal against the decision paying the appeal fee on the same day. The Statement of Grounds of Appeal was filed on 8 November 1995.

V. In a communication pursuant to Article 11(2) RPBA dated 14 November 1996 accompanying the summons to oral proceedings, the Board expressed its provisional opinion that the skilled person would not be induced to combine the teaching of (E1) with that of (E2) or (E3) such as to be led in an obvious manner to the subject-matter of Claims 1 and 4, respectively.

VI. With a letter dated 9 July 1997, the Appellant announced that he did not intend to participate in the oral proceedings scheduled. The proceedings were accordingly cancelled.

VII. The Appellant requested that the patent be revoked. In the Statement of Grounds of Appeal, he argued essentially as follows:

The decision of the Opposition Division has been erroneously based on the assumption that (E2) describes only an ash cooler with a split windbox whereby the introduction of air into the windbox can only be switched on or switched off, which amounts to a discontinuous operation. The fact is that (E2) discloses a windbox valve which allows both continuous and discontinuous operation. It is only for the application as an ash cooler described in (E2) that the discontinuous operation is preferred since therewith a lower cooling air consumption is obtained. There should be no doubt that in the continuous operation of the windbox valve also described the introduction of the fluidising air must be controlled. (E2) discloses therefore a windbox which by means of an independent control of the fluidising air rate for the ash input and ash output brings about a mass flow control.

It was not, therefore, inventive to replace the windbox valve according to (E1) by the windbox valve described by (E2).

Furthermore, a corresponding windbox valve designed as an ash cooler is known from Figure 9 of (E3).

VIII. In support of his request for dismissing the appeal the Respondent (Patentee) argued essentially as follows:

The fact that (E2) discloses a windbox which permits both continuous and discontinuous operation was entirely accepted by the Respondent. The sealing is controlled by switching on or off the air fluidising the ash cooler, no other options being disclosed. There is no possibility of independently regulating the flow of air or gas into the first and second conduits to control the rate of separated material passed back to the fluidised bed.

What the citation deals with is a particular problem in cooling and removing ash which is a totally different medium from recycled partially burnt particles. The expert would not look to the abrupt on/off control according to (E2) which is suitable in an ash cooler, for a solution to the fine control of a fluidised bed and its associated boiler. It is not, therefore, obvious to combine citations (E1) and (E2).

Furthermore, it is notable that the Appellant nowhere deals with the question of why it should be obvious to take a windbox valve from a situation where one is dealing with the cooling and removal of ash and use a similar control technique to control the through passage of separated particles so as to provide fine control for the operation of a fluidised bed burner. As the Appellant has been unable to make any justification in this respect, it is clear that no such valid argument exists.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

The nearest prior art document is (E1) which describes a fluidised bed combustion system and a method of controlling such a system comprising the features according to the precharacterising portions of Claims 1 and 4, respectively. The citation discloses neither a first conduit for introducing air or gas into the seal vessel in a path aligned with the flow path of the separated material from the dipleg, nor a second conduit for introducing air or gas into an area of the seal vessel surrounding the flow path from said first

conduit, nor means for independently regulating the air or gas flow into the first and second conduits to control the rate of separated material passed back to the fluidised bed, according to the characterising portion of Claim 1. It also does not disclose the features according to the characterising portion of Claim 4 which, except for being formulated in the different category "method", correspond with those of the characterising portion of Claim 1.

The subject-matter of Claims 1 and 4, respectively, is therefore novel.

Since novelty was not disputed by the Appellant, this issue needs no further consideration.

3. *Inventive step*

3.1 In the fluidised bed reactor system according to US-A-4 781 574 referred to in the description and corresponding to (E1) an air source is disposed at the separated-solids outlet of a cyclone separator and discharges air into the separator in a direction opposite the direction of flow of the separated solids. The air entrains a portion of the solids, passes upwardly into the interior of the separator and interferes with the operation of the same reducing thus the amount of separation of the solids from the flue gases. Although the solids recycle rate can be regulated by this technique without great expense, the interference with the operation of the separator is regarded as a disadvantage.

The inherent problem to be solved by the invention with respect to (E1) can therefore be seen in controlling the return rate of recycled solids from the seal vessel to the reactor bed while at the same time avoiding a reverse flow of solids through the separator.

By providing two separately controllable air or gas flows into the seal vessel, the first flow conduit being aligned with the flow path of the separated material into the seal vessel and the second flow conduit surrounding the flow path from the first conduit, the return rate of the solids can be controlled. As illustrated in the description of the patent in suit, the air or gas flow into the plenum (38a), that is the flow from the first conduit (42), can be regulated by the valve (46) independently of the flow into the plenum (38b), that is the flow from the second conduit (44), so that an increase in the air or gas flow into the plenum (38a) relative to that into the plenum (38b) will decrease the solids recycle rate. At the same time, the air or gas flow from the first conduit (42) can be controlled so as not to affect the operation of the separator.

Thus, there is no doubt that the above-indicated problem is completely solved by the system and method according to Claims 1 and 4, respectively.

3.2 The Appellant bases his attack of obviousness mainly on (E2) arguing that the system disclosed therein comprises a windbox valve which allows both continuous and discontinuous operation. Further according to the Appellant, in continuous operation of the windbox valve the supply of fluidising air must be controlled so that (E2) discloses an independent control of the ash input and output mass flows. It would not, therefore, be inventive to replace the windbox valve according to (E1) by the valve known from (E2).

(E2) discloses an ash cooler of a fluidised bed combustion system (see in particular the heading "Entaschung" on page 460), the cooler comprising a split windbox with one part thereof being positioned underneath the ash inlet pipe. When the air supply to this part of the windbox is initiated, the ash underneath the ash inlet pipe starts to flow to the ash cooler. Subsequently, after a predetermined ash level has been reached, the air supply is switched off interrupting thereby the flow of ash.

The operation is discontinuous, that is with subsequent switching-on and switching-off of the air supply. The Appellant is correct in stating that the operation may also be continuous as outlined in (E2). However, no information has been given as to whether there are provided regulating means different from the means for switching-on and switching-off the air supply. Moreover, (E2) dissuades from the continuous mode of operation with the reason that the consumption of cooling air involved therewith is increased in relation to the discontinuous mode of operation.

3.3 As illustrated above, (E2) deals with the problem of cooling and removing ash which is fundamentally different from the problem of recycling separated particulate material from a seal vessel in a controlled manner back to the fluidised bed reactor. Due to this difference in the problems, the skilled person would underlying not consult (E2) when looking for a solution to the inherent problem of the invention.

As a further point, it is noted that (E2) teaches to remove the ash by switching-on or switching-off the air supply to the ash cooler, whether the mode of operation is discontinuous or continuous. There is no hint of independently regulating the flow of air or gas through

a first and a second conduit in order to control the rate of separated material passed back to the fluidised bed.

Thus, even if the skilled person, irrespective of the differences as to the underlying problems, were to combine the teachings of (E1) and (E2), he would not arrive at the subject-matter of Claims 1 and 4, respectively, since neither of these citations discloses the concept of regulating the flow of material by means of independently controllable introduction of air or gas into a first and second conduit, the conduits being connected to define areas of the seal vessel as indicated in any of these claims. It is also clear that by such a combination of prior art documents the object of preventing any reverse flow of the material through the separator could not be achieved.

3.4 The appellant has further referred to (E3) stating that a windbox valve designed as an ash cooler is known from Figure 9 of this citation. Since no conclusion has been drawn from this statement, it can only be assumed that according to the Appellant's opinion the invention is also arrived at by a combination of (E1) and (E3).

Figure 9 of (E3) with the pertinent description (see the paragraph under the heading "Aschekühler" on page 706) discloses an ash cooler as part of a fluidised bed combustion system, the ash cooler comprising a first set of nozzles substantially aligned with a pipe for transporting ash into the cooler and a second set of nozzles operating as fluidisation means for removing the cone of ash formed underneath the ash pipe, the ash being transported to the ash collector.

The problem to be solved by this ash cooler is to provide for a simple and controlled filling of the ash cooler with ash whilst avoiding a mechanical locking device for the ash filling pipe. There is no suggestion as to the aim of controlling the return rate of recycled solids material to the fluidisation reactor bed. Besides, (E3) does not suggest the independent regulation of the air and gas flow into both the first and second set of nozzles or conduits for controlling the rate of material to be transported. Furthermore, the second set of nozzles or conduits does not introduce air or gas into an area of the seal vessel surrounding the path aligned with the flow path of the separated material into the seal vessel, but rather into an area situated laterally thereof near the opening for ash removal. Such a configuration seems to be appropriate in the system described in (E3) in which the filling of the ash cooler with ash in a reliable manner is aimed at. It is, however, unacceptable in the system according to the patent in suit, in which a homogeneously fluidised material in the seal vessel is required for achieving controlled recycling of solids material to the reactor bed without impairing the separator operation.

It follows from the above considerations that even if the skilled person were to consider a combination of (E1) and (E3), he would not arrive thereby in an obvious manner at the subject-matter of Claims 1 and 4, respectively.

3.5 Summarizing, the Board has come to the finding that the subject-matter of Claims 1 and 4, respectively, cannot be derived in an obvious manner from a combination of the citations (E1) and (E2) or (E1) and (E3) and is therefore regarded as inventive (Article 56 EPC).

4. Claims 1 and 4 are therefore valid (Article 52(1) EPC) and the same applies to the dependent Claims 2, 3 and 5 which concern further embodiments of the invention.

5. Consequently, the appeal has to be dismissed.

6. The announcement of the Appellant (see above point VI) that he did not intend to participate in the oral proceedings is regarded by the Board as withdrawal of his auxiliary request for oral proceedings submitted with his letter of appeal.

Since the request of the Respondent for dismissal of the appeal is allowed, his auxiliary request for oral proceedings is without object.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

N. Maslin

The Chairman:

C. T. Wilson