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D E C I S I O N
of 27 November 1997

Case Number: T 0091/95 - 3.3.5

Application Number: 90312207.5

Publication Number: 0437028

IPC: B01J 8/00

Language of the proceedings: EN

Title of invention:
Impact type particle separator

Patentee:
THE BABCOCK & WILCOX COMPANY

Opponent:
L. & C. Steinmüller GmbH

Headword:
Particle separator/BABCOCK

Relevant legal provisions:
EPC Art. 54(1), 56

Keyword:
"Novelty - yes; inventive step - yes, unobvious solution of a technical problem"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0091/95 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 27 November 1997

Appellant: (Opponent)
L. & C. Steinmüller GmbH
D-51641 Gummersbach (DE)

Representative:
-

Respondent: (Proprietor of the patent)
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Representative:
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 2 December 1994 concerning maintenance of European patent No. 0 437 028 in amended form.

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar
R. E. Teschemacher

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division maintaining European patent No. 0 437 028 in amended form.

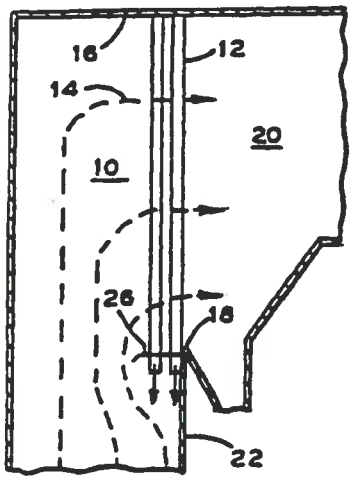
II. The decision under appeal was based on the set of amended claims 1 to 14 submitted during oral proceedings on 21 October 1994. Claim 1 thereof reads as follows (for the reference numbers see Figure 5 below):

"An internal impact type particle separator disposed in a circulating fluidized bed combustor (10) which separator comprises a plurality of concave impingement members (12) supported within a furnace enclosure (16) the impingement members (12) extending uniformly in at least two staggered rows fully across and just upstream of a furnace exit opening (18), the impingement members (12) also extending along the length of the exit opening (18) and terminating at a location below the lower elevation of the exit opening (18) so that the collected particles can fall unobstructed and unchannelled directly underneath the impingement members (12) and along one wall (22) of the furnace enclosure (16) to be re-entrained and recycled, the staggered rows being spaced from each other a distance of at least 50% of the distance between adjacent ones of the impingement members (12) with one of the rows being spaced from said one furnace wall (22) a distance less than the depth (E) of each of the impingement member (12); and

a baffle (26) attached to the lower end region of the impingement members (12) below the lower elevation of the furnace exit opening (18) with the baffle (26) obstructing the vertical passage of gas between the

impingement members (12)."

FIG.5



The Opposition Division considered, inter alia, the following document:

National Board Bulletin, July 1989, pages 6 to 10 (D1a).

The Opposition Division held that D1a represented the closest prior art and that the problem underlying the invention was to further enhance the density of the fluidized bed and consequently the furnace efficiency under the existing flow velocities. This problem was solved by the separator of claim 1; in particular by the use of the baffle (26). They considered that the said baffle was not present in the apparatus disclosed by D1a, and that none of the cited prior art documents suggested disposing a baffle obstructing the vertical passage of gas at the lower end region of the impingement members.

III. With the statement of the grounds of appeal, the Appellant submitted, inter alia, the following new documents:

WO 88/04010 (D3b), and

EP-A-346 062,

and maintained that amended claim 1 lacked novelty over D1a, or at least an inventive step in view of D1a, D3b, and EP-A-346 062.

IV. The Respondent replied that D1a did not disclose the said baffle and that there was no suggestion in the cited prior art for using such a baffle.

V. Oral proceedings were held on 27 November 1997. In these proceedings the Appellant only relied on D1a and D3b as state of the art with respect to inventive step.

VI. The Appellant's written and oral submissions can be summarized as follows:

In Figure 1 of D1a there is a fine line at the position where in Figure 5 of the patent in suit the baffle (26) is shown. This line is alleged to disclose the said baffle. The particles in the flue gas could only be separated therefrom by the impingement beams if they hit the beams at the front side. It was therefore obvious to guide the flue gas so that a vertical gas stream between the beams is prevented. The problem of preventing particles falling from the impingement members from being caught by the upwards streaming flue gas before they could reach the fluid bed, had been treated in D3b. According to D3b, particles falling from inclined impingement beams were guided in a channel, the upper part thereof was widened and deviated the flue gas stream in the same way as the baffle in the patent in suit. The fact that the beams in D3b were inclined would not prevent the skilled

person from using the same principle in the fluid bed furnace of D1a. The most obvious way of deviating the gas stream underneath the impingement beams was to attach a baffle to the lower end of the impingement beams.

VII. The Appellant requested that the decision under appeal be set aside and the patent be revoked in its entirety.

The Respondent requested that the appeal be dismissed.

At the end of the oral proceedings the decision of the Board to dismiss the appeal was announced.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

Novelty was objected to on the basis of Figure 1 of D1a. According to the Appellant, this figure shows a fine line at the lower end of the impingement beams indicating a baffle. The Board is able to detect this detail, which may also be interpreted as parallel dots, but cannot accept the Appellant's interpretation. The accompanying text is silent with respect to this detail which is at the border of visibility. A comparable "fine line" is also present about halfway the beams, which makes the interpretation of the said fine lines as baffles unlikely. Moreover, since a baffle highly influences the flue gas stream, such a baffle should have been mentioned in the text, or at least clearly indicated in the figures if it had been present. The Board holds, therefore, that D1a does not clearly and unambiguously disclose a baffle at the lower end region

of the impingement members, so that the particle separator of claim 1 differs in at least this essential feature from the separator disclosed in D1a. Since no other document on file discloses an apparatus comprising all the features of present claim 1, its subject matter is novel.

3. *Inventive step*

3.1 It is undisputed that D1a represents the closest prior art. It discloses a circulating fluid bed boiler (CFB-boiler) comprising an internal impact type particle separator having a plurality of concave impingement members extending in at least two rows across and just upstream of the furnace exit opening. The impingement members also extend along the end of the exit opening and terminate at a location below the elevation of the exit opening. As indicated above, D1a does not disclose a baffle at the lower end region of the impingement members obstructing the vertical passage of gas between the impingement members. According to the patent specification, the inclusion of the baffle increases the bed density about three times over the same arrangement without the baffle (column 5, lines 8 to 11). Further according to the patent specification, improved bed density improves the carbon conversion efficiency and the sorbent utilization for sulphur capture (column 5, lines 11 to 17).

In agreement with the contested decision and the patent specification, the technical problem underlying the invention can thus be seen in providing an internal impact type particle separator for a CFB-boiler, which increases the efficiency of the boiler with regard to carbon conversion and sulphur capture.

The above-mentioned problem is solved by a separator according to claim 1, having a baffle attached to the lower end region of the impingement members.

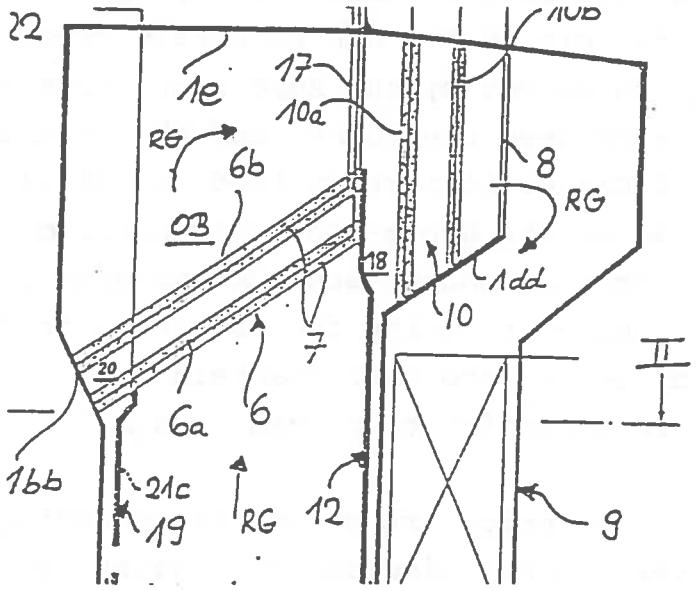
During the oral proceedings before the Opposition Division, the Respondent had submitted comparative examples which showed that, in experiments with sand mixtures, the bed density was markedly increased if a bottom plate (baffle) was attached to the two rows of in-shaft U-beams (impingement members). Neither this result, nor the above-mentioned relationship between efficiency and bed density, was contested by the Appellant. The Board is, therefore, satisfied that the claimed separator actually solves the above mentioned technical problem.

3.3 It remains therefore to be decided if, for solving the above stated problem, it was obvious to attach a baffle to the lower end region of the impingement members.

3.3.1 In D1a there is no suggestion for such a baffle. The Appellant's allegation that, if one wants to separate the particles from the flue gas, it is obvious to deviate the flue gas stream such that the upward gas stream between the impingement beams is obstructed and the particles in the gas stream hit the impingement beams from the frontside, is not supported by D1a. Neither the text, nor the figures in D1a reveal any means for deviating the flue gas stream below the impingement beams.

3.3.2 D3b discloses a CFB-boiler comprising inclined concave impingement beams across the furnace from the lower end of the flue gas exit downwards to the opposite wall of the furnaces. Particles caught by the beams are guided to channels (21) formed by said opposite wall and a parallel situated partition wall (19). The upper part of the said partition wall is bended towards the inside

of the furnace to form a funnel (20) to guide the particles from the impingement beams to the said channels (page 8 and Figure 1/3, the relevant part of it being shown below).



This construction is essentially different from that in D1a. According to D1a and present claim 1, the impingement beams extend along the furnace exit and terminate under the exit opening, so that the particles can fall unobstructed and **unchannelled** directly underneath the impingement beams along the furnace wall at the exit side.

The Board accepts the Appellant's submission that the funnel wall inclined to the interior of the furnace deviates the flue gas stream in a way similar to the deviation by the baffle in the patent in suit, but cannot accept his conclusion that it was therefore obvious to provide the furnace of D1a with similar deviating means underneath the impingement beams. Similarities between the prior art and the patent in suit can only be established on hindsight and thus cannot be an argument against inventive step. The presence of the funnel in D3b is linked with the channels; no other function thereof is disclosed in

D3b. Since the furnace of D1a does not have such channels, there is no obvious reason to introduce such a funnel under the impingement beams of D1a, let alone to transform such a funnel into a baffle obstructing the upwards gas flow between the impingement beams. That the channels in D3b can be partly or completely open, as pointed out by the Appellant, does not affect the linkage between the funnel and the channel. The teaching of D3a would perhaps lead the skilled person, trying to solve the above-mentioned problem, to introduce channels underneath the impingement beams in D1a with a funnel to guide the particles from the impingement beams into such channels, but not to a construction according to present claim 1.

3.3.3 The other cited prior art documents including EP-A-346 062, do not disclose or suggest the use of a baffle obstructing the gas flow between impingement members in a CFB-boiler either. Since the Appellant no longer relied on these citations, there is no need to discuss them here.

3.4 In summary, the available prior art does not give the skilled person any incentive to solve the above mentioned technical problem by an internal impact type particle separator as claimed in present claim 1.

It follows from the foregoing considerations that the subject matter of Claim 1 is not only new, but also involves an inventive step. The same applies to the subject matter of Claims 2 to 14 being dependent upon claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

P. Martorana

The Chairman:

R. Spangenberg

Te 18.12.97

Lw. 17.12.97

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