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D E C I S I O N
of 20 July 1995

Case Number: T 0651/93 - 3.2.1
Application Number: 85302071.7
Publication Number: 0157575
IPC: B21J 5/00, B21J 13/02

Language of the proceedings: EN

Title of invention:

Method for reduction in width of slabs by pressing and press
for the same

Patentee:

KAWASAKI STEEL CORPORATION

Opponent:

SMS Schloemann-Siemag AG

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

T 0204/83, T 0666/89

Catchword:

-



Case Number: T 0651/93 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 20 July 1995

Appellant:
(Opponent)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted on 28 May
1993 concerning maintenance of European patent
No. 0 157 575 in amended form.

Composition of the Board:

Chairman: F. Pröls
Members: S. Crane
J.-C. de Preter

Summary of Facts and Submissions

I. European patent No. 0 157 575 was granted on 23 May 1990 on the basis of European patent application No. 85 302 071.7.

II. The granted patent was opposed by the Appellants on the grounds that its subject-matter lacked novelty and/or inventive step.

Of the prior art documents referred to in the opposition proceedings only the following have been relied upon during the appeal proceedings:

- (D1) DE-A-2 531 591,
- (D4) JP-A-56/114561, and
- (D6) JP-A-58/215202.

(The Appellants provided translations into German of documents D4 and D6.)

III. With its decision given at oral proceedings on 30 April 1993 and issued in writing on 28 May 1993 the Opposition Division held that the patent was to be maintained in amended form on the basis of independent Claims 1 and 11 filed on 5 April 1993 together with dependent Claims 2 to 10 and 12 as granted.

IV. An appeal against this decision was filed on 14 July 1993 and the fee for appeal paid at the same time. The Statement of Grounds of Appeal was filed on 28 September 1993. With this statement the Appellants referred to a further prior art document JP-A-57/58901 (D7), of which they also filed a translation into German.

- V. In a communication pursuant to Article 11(2) RPBA dated 27 March 1995 the Board expressed its view inter alia that the subject-matter of Claim 11 lacked novelty with respect to documents D6 and D7.
- VI. By means of a telefax dated 21 June 1995 the Respondents (Proprietors of the patent) filed inter alia a new Claim 11 according to their main request, and a number of claims according to various auxiliary requests.
- VII. In a further submission received by telefax on 7 July 1995 the Appellants referred to EP-A-112 516 (D8) as constituting a novelty destroying document under Article 54(3) EPC.

As regards the claims according to the auxiliary requests of the Respondents the Appellants urged that these be referred back to the Opposition Division for further examination as they contained features which had previously not been discussed.

- VIII. Oral proceedings were held on 20 July 1995.

At the oral proceedings the Respondents clarified their main request as being for maintenance of the patent in amended form on the basis of the following documents:

Claim 1 filed on 5 April 1993;
Claim 11 according to Appendix III filed on 21 June 1995;
Claims 2 to 10 and 12 as granted;
Description as submitted at the oral proceedings;
Drawings as granted.

Claim 1 reads as follows:

"A method of reducing the width of a hot slab (2) by pressing said slab (2) with a pair of anvils (1) so that the hot slab (2) is advanced between the anvils (1) such that it is pressed along its entire length by said anvils (1) to reduce its width, wherein each of said anvils (1) comprises a plane inclined entrance portion (A, B) and a plane parallel portion parallel to the advancing direction (R) of the hot slab (2) and contiguous with the inclined entrance portion (A, B), and characterised in that said plane inclined entrance portion (A, B) is inclined at an angle (θ) of more than 10° and less than 18° relative to the advancing direction of the hot slab."

Dependent Claims 2 to 10 relate to preferred embodiments of the method according to Claim 1.

Claim 11 reads as follows:

"A press for reducing widths of hot slabs (2) comprising a pair of anvils (1) wherein each anvil of said pair is controllable by a control apparatus (55) to move a predetermined distance (2a) between an open and a closed position and comprises a plane inclined entrance portion (A, B) and a plane parallel portion (BC) parallel to the advancing direction of the hot slab (2) and contiguous with the inclined portion (AB), characterised in that the plane inclined entrance portion has an inclined angle more than 10° and less than 18° on an entrance side relative to the advancing direction (R) of the slabs (2), and in that there are provided pinch rollers (10, 17, 30, 30', 57) controllable by controlling means (55) to advance the

slab intermittently, when the anvils are at the open position, such that a slab (2) may be pressed along its entire length."

Dependent Claim 12 relates to a preferred embodiment of the press according to Claim 11.

IX. In support of their request for revocation of the patent the Appellants argued substantially as follows:

According to document D4, on which the preamble of Claim 1 was based, the angle between the inclined portion of the anvil and the portion parallel to the advancing direction of the slab was 25° . It was however stated that this angle was not critical so that the skilled person was free to choose an angle which best suited his needs. In this respect reference could be had to documents D6 and D7. According to document D6 the corresponding angle of the anvil lay between 10° and 30° and although a preferred value of 20° was given it was apparent from the document that an angle between 10° and 18° as currently claimed by the patent in suit would give satisfactory results. Furthermore, it was apparent from a consideration of the mathematical relationships given in Claim 1 of document D6 that this document envisaged the slab being pressed along its whole length. Document D7 on the other hand gave a preferred range for the relevant angle of the anvil of between 10° and 20° , which corresponded closely to the range presently claimed. No surprising effect in the reduction of "dog bone" formation was achieved in the claimed range which represented merely an arbitrary selection from what was well-known to the skilled person. It was in any case already known from document D1 that the continuous width reduction of a slab by means of press anvils resulted in

uniform cross-sectional changes, i.e. avoided "dog bone" formation, so the Respondents could not rely on having made some new discovery in this context.

The features added to the independent apparatus claim (Claim 11) in comparison with the corresponding claim which the Board had already rightly indicated lacked novelty were of a wholly conventional nature and could add nothing of inventive significance to the claim.

The relevance of document D8, which had been cited in the Search Report, only became fully apparent with the filing on 21 June 1995 of auxiliary requests which contained features disclosed only in that document. Resultant study of document D8 had shown that it in fact disclosed either explicitly or implicitly all the features of present Claims 1 and 11.

In particular, the only feature not explicitly disclosed in document D8 was the value of the angle θ between the inclined and parallel portions of the respective anvil. The skilled person would however recognise from the drawings that the angle involved corresponded to that conventionally used in the art, as taught for example by documents D6 or D7, so that he would understand document D8 as teaching a value of the angle θ lying within the range presently claimed of 10° to 18° . This approach to the evaluation of novelty corresponded to that to be found in decision T 666/89 (OJ EPO 1993, 495).

- X. In reply the Respondents argued substantially as follows:

Documents D6 and D7 were concerned exclusively with preforming the ends of slabs before these were subjected to width reduction by rolling. The details given there of the preferred angles between the inclined and parallel portions of each anvil were therefore of no relevance to a method in which width reduction of the slab along its entire length was performed by pressing and not by rolling. The only really relevant prior art in this context was document D4 which certainly did not suggest an angle of between 10° and 18° . The Respondents had found that within this range it was possible to achieve substantial uniformity of cross-section with avoidance of "dog bones" and had thus made a significant technical advance which allowed the theoretical possibility of width reduction by pressing to be put into practical effect. Document D1 was of limited relevance to the present invention since the press disclosed there worked on a different principle, with the slab being in constant motion and with "dog bone" formation being prevented by using anvils with grooved workfaces.

Document D8 disclosed neither explicitly nor implicitly the required value of the angle between the inclined portion and parallel portion of the anvil. The drawings in this document were clearly schematic and so could not be measured as to produce a meaningful value of the angle. To attempt to incorporate values for the angle from documents D6 and D7 was clearly inappropriate, especially as those documents related only to preforming the ends of a slab.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
2. *Amendments*

Present Claim 1 according to the main request of the Respondents has been derived from granted Claim 1 by the addition of the qualification that the inclined entrance portion and the parallel portion of each anvil are "plane", and by the division of the features of the claim between its preamble and characterising clause taking document D4 as the closest state of the art. The plane nature of the relevant portions of the anvils can be seen clearly and unambiguously from the originally filed drawings.

In comparison with granted Claim 11 the present Claim 11 also includes the feature that the relevant portions of the anvils are plane, as mentioned above, together with the additional feature that the press includes pinch rollers controllable by controlling means to advance the slab intermittently, when the anvils are open, such that the slab may be pressed along its entire length. This latter feature is to be found in the originally filed description at page 12, lines 16 to 27 and page 20, line 20 to page 21, line 22.

The dependent Claims 2 to 10 and 12 correspond to those of the granted patent.

The amendments made to the description are merely to refer there to the most relevant state of the art and to bring it into line with the terms of the amended independent claims.

There are therefore no objections under Articles 123(2) and (3) EPC to the documents corresponding to the main request.

3. *State of the art*

3.1 Document D1 relates to a press for changing the cross-section of a constantly moving slab before it is fed to a planetary rolling mill. To this end the press anvils are arranged such that they can move in the longitudinal direction of the slab as it advances. The press of Figures 11 and 12 is indicated as being particularly suitable for achieving a large width reduction in the slab without significant variation of the thickness of the slab across its width. The press anvils can be seen in Figure 12 to have grooves in their faces in which the edges of the slab are located.

3.2 Document D4 is directed to a method of preforming the ends of a slab between press anvils before it undergoes width reduction along its entire length. Each press anvil has an inclined entrance portion and a portion parallel to the longitudinal axis of the slab. To reduce crop losses it is proposed that the length of the end of the slab disposed between the parallel portions of the anvils should lie between one half and one seventh of the value obtained by subtracting one half of the width reduction on pressing from the original width of the slab. After preforming of its ends the slab may be rolled to reduce its width along its entire length or, as proposed with reference to Figures 14 and 15, this can be achieved by repeated use of the press anvils. The

angle between the inclined and parallel portions of the anvils is indicated as being 25° and it is stated that since this angle merely serves to facilitate deformation in the transitional area between deformed and non-deformed parts of the slab then other angles are possible or alternatively a rounded surface could be used.

3.3 Document D6 is also concerned with optimising the preforming of the ends of a slab before it is rolled to reduce its width and thickness. Here it is proposed to use press anvils each of which has a parallel portion disposed between two inclined portions. The angle between the parallel portion and each inclined portion lies in the range of 10° to 30° , preferably 20° . The slab is preformed between the press anvils in such a way that a short undeformed region remains at each end.

3.4 Document D7 is again concerned with preforming the ends of a slab before it is rolled, in order to reduce crop losses. The press anvils proposed here each have a portion parallel to the longitudinal axis of the slab and an inclined entry portion. The angle between this portions is chosen in such a way that during pressing the slab does not have to be held against longitudinal displacement. An angle of less than 20° is suitable for this. Too small an angle would mean however that the length of the slab deformed by the anvils would become excessive, thus requiring high press forces.

3.5 Document D8 was published after the priority date of the contested patent and belongs to the state of the art according to Article 54(3) EPC. It discloses a method of reducing the width of a slab over its entire length corresponding to what is stated in the preamble of present Claim 1, and a press for performing this method. The angle between the inclined portion and parallel

portion of each anvil is designated as θ in the drawings of document D8 but no explicit value for θ is given in the description.

4. *Novelty*

- 4.1 It is not in dispute that document D8 explicitly discloses all of the features of present independent Claims 1 and 11 with the exception that there is no specific indication of the inclined entrance portion of the anvil being inclined at an angle of more than 10° and less than 18° relative to the advancing direction of the slab.

The Appellants sought to bridge this gap in the disclosure of document D8 by reference to the general knowledge of the skilled person. They argued that the skilled person would appreciate from the drawings of document D8 that the relevant angle corresponded to that normally used and that angles of inclination lying within the claimed range were well-known, as could be seen from documents D6 and D7. The Board is not convinced that this approach, which the Appellants claimed was based on what is said in decision T 666/89 (supra) - that decision being essentially concerned with overlapping composition ranges - is the appropriate one in the present circumstances. In any case the line of argument of the Appellants must fail for the reason that there was no clearly established, and therefore for the skilled person implicit, value of the inclination angle which was to be used in the relevant width reduction method. Documents D6 and D7 relied upon by the Appellants in this respect do not in fact relate to a process in which the width of the slab is reduced along its entire length. (The conflicting contention of the Appellants with regard to document D6 is incorrect as is explained in more detail in point 4.2 below.) Thus the

only document which actually mentions a specific inclination angle in the context of the claimed method and apparatus is document D4 and that angle is 25°, which lies well outside the claimed range.

Although the Appellants did not seek to rely on this argument at the oral proceedings they had also in their submission received on 7 July 1995 stated that they had measured the value of the inclination angle θ from the drawings of document D8 and that this angle was approximately 12°. It is however clear that these drawings are purely schematic and there is no suggestion in the description that the angle used in the drawings is in any way significant. The actual value of θ measured from the drawings is not therefore to be considered as belonging to the technical disclosure of document D8 (see decision T 204/83, OJ EPO 1985, 310).

4.2 Since the Appellants argued that document D6 disclosed a method in which the slab was reduced in width along its entire length by means of the press anvils, these anvils having an inclination angle falling within the claimed range, they were in effect arguing that the subject-matter of present Claim 1 lacked novelty with respect to this document.

However, document D6 is clearly and unambiguously directed to a method of preforming the end regions of a slab before this is subjected to rolling. The Board can find nothing in this document which could suggest that the width of the slab is also reduced along its entire length by repeated application of the press anvils. The Appellants relied upon a formula in Claim 1 of document D6 as showing that the unpressed length of slab could equal zero. However the unpressed length of slab referred to here is that between the end of the slab and

the position where the anvils preform the end region of the slab. It has nothing to do with the central region of the slab between the preformed end regions.

This line of attack of the Appellants is therefore without merit.

- 4.3 In the opinion of the Board document D4, on which the respective preambles of present Claims 1 and 11 are based, represents the closest pre-published state of the art. None of the documents D1, D6 or D7 discloses a method or a press having all the features set out in the preambles of the respective claims. The subject-matter of Claim 1 is distinguished from document D4 by virtue of the range of inclination angle defined in the characterising clause of the claim. As for the subject-matter of Claim 11 this is distinguished from document D4 by the stated range of inclination angle and by the provision of pinch rollers controlled in the manner set out in the characterising clause of the claim.

It therefore follows that the subject-matter of present Claims 1 and 11 according to the main request of the Respondents is novel.

5. *Inventive step*

When the width of a hot slab is reduced substantially there is a tendency for the deformation to be non-uniform across the slab such that the reduced slab has a cross-section resembling a "dog bone", in other words having a thinner central region with bulbous protrusions at each end. This "dog bone" shape leads to complications when the slab is subsequently rolled

between horizontal rolls, in particular to the generation of tensile stresses in the rolled material which can lead to cracking.

The present invention is concerned with the provision of a method and apparatus for reducing the width of a hot slab by pressing it along its entire length in such a manner that the non-uniformity in cross-section across the reduced slab is minimised. According to the explanations given in the patent specification the angle of inclination between the respective inclined portions and parallel portions of the press anvils is critical for achieving this goal. As stated in present Claim 1 and 11 that angle is greater than 10° and less than 18° .

The essential question to be addressed for the evaluation of inventive step is thus whether the state of the art would lead the skilled person to adopt such an angle of inclination when putting into practice the proposal of document D4 to reduce the width of the slab by means of press anvils each having an inclined entrance portion and a portion parallel to the advancing direction of the slab.

In this respect it must be noted firstly that the proposal in document D4 is in very general terms and there is no suggestion that the use of press anvils of the indicated form would in any way be associated with a reduction in "dog bone" formation or that the value of the angle of inclination (25° is mentioned in document D4) played some role in this. Thus on the basis of document D4 considered in isolation the skilled person had no incentive to investigate how "dog bone" formation is related to the angle of inclination.

The Appellants rely however on documents D6 and D7 as showing that the skilled person would have had good reason to choose an angle of inclination in the range claimed. The Board cannot accept this. As explained above in a different context (see points 4.1 and 4.2) the documents D6 and D7 do not relate to the pressing of a slab to reduce its width along its entire length but merely to preforming the ends of a slab before it is subjected to rolling. They are not concerned with the minimisation of "dog bone" formation. Thus there is no logical reason why the skilled person in his efforts to achieve uniform deformation across the width of the slab should have any reference to the documents D6 and D7. It must also be noted in this respect that the documents D6 and D7 do not in any case, when considered together, give the skilled person a clear and unambiguous direction to choose an angle of inclination for an anvil which would lie in the range of 10° to 18° since the preferred value of 20° given in document D6 lies outside that range.

As for document D1 there is nothing here which could be taken as suggesting that "dog bone" formation could be reduced by choosing a particular angle of inclination for the press anvils. Instead, that document, with reference to Figures 11 and 12, proposes an alternative solution to this problem in which the press anvils have grooved faces so that parts of the anvils overlie the edges of the slab.

The Board therefore comes to the conclusion that the subject-matter of present Claims 1 and 11 cannot be derived in an obvious manner from the state of the art and accordingly involves an inventive step, Article 56 EPC.

6. *Remittal to the first instance*

The request of the Appellants that the matter be remitted to the first instance for further examination only applied to the claims according to the various auxiliary requests of the Respondents. The Board has however decided to maintain the patent in amended form on the basis of their main request. Claim 1 of this request corresponds to that underlying the contested decision. In comparison with Claim 11 considered by the Opposition Division present Claim 11 only includes features which make it clear that the press is particularly adapted to perform the method according to Claim 1. Thus there would have been no justification for remitting these claims to the first instance for examination of their substance.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

Claim 1 filed on 5 April 1993;

Claim 11 according to Appendix III filed on 21 June 1995;

Claims 2 to 10 and 12 as granted;

Description as filed at the oral proceedings;

Drawings as granted.

The Registrar:



S. Fabiani

The Chairman:



F. Pröls

Pröls
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