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D E C I S I O N
of 21 December 1999

Case Number: T 0105/98 - 3.2.1

Application Number: 92305560.2

Publication Number: 0519705

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Language of the proceedings: EN

Title of invention:
Mandrel mill capable of preventing stripping miss

Patentee:
KAWASAKI STEEL CORPORATION

Opponent:
Mannesmann Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
"Amendments - added subject-matter (no)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
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Case Number: T 0105/98 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 21 December 1999

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 28 November 1997 rejecting the opposition filed against European patent No. 0 519 705 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: F. A. Gumbel

Members: P. Alting van Geusau
J. H. P. Willems

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 519 705 in respect of European patent application No. 92 305 560.2, filed on 17 June 1992, was published on 3 May 1995.

II. Notice of opposition was filed by the appellant (opponent) on 2 February 1996 on the grounds of Article 100(a) EPC.

In respect of an alleged lack of novelty and inventive step the opposition was supported by the following document:

D1: Book in the Russian language, pages 193, 194 and 209 to 212, with translation in the German language.
Translation of the title into German:
"Werkzeugkalibrierung für Rohrwalzwerke" by Ju. M. Matveev and Ja. L. Vatkin, published by "Metallurgie", Moskau 1970.

With letter dated 31 December 1996 the appellant filed, translations into German of pages 81, 82 and 83 (filed as "Anlage 5"), pages 202 and 203 (Anlage 4) and pages 196 and 197 (filed as "Anlage 6") of D1.

III. By its decision dated 28 November 1997 the Opposition Division rejected the opposition.

The Opposition Division was of the opinion that, the appellant's calculations based on the embodiment disclosed in D1 in relation to Figures 75 and Table 36

did not prove that this rolling mill anticipated the subject-matter of claim 1. Furthermore, whilst D1 mentioned that using oval calipers might aid mandrel stripping, no suggestion of specific relative dimensions of the rolls compared to the last rolling stand could be found to satisfy the corresponding requirements defined in claim 1. Therefore the subject-matter of the granted claim was considered to be based on an inventive step.

IV. On 27 January 1997 a notice of appeal was lodged against that decision and the appeal fee was paid on the same day.

The statement of grounds of appeal was filed on 27 March 1997.

V. In a communication issued in preparation for oral proceedings the Board observed that having regard to the disclosures of D1 in accordance with "Anlagen 4 to 6" and the second embodiment of a caliper shape as shown in Figure 71 of D1 it appeared that the shape of the groove in the caliper-roll of the example shown in Figure 75 was entirely determined by the parameters given in Table 36 of D1. Therefore the exact circumference of the grooves defined by the calipers in the different stands was accurately calculable on the basis of the formula given at the end of page 4 of the appellant's letter dated 31 December 1996.

When checking the results of the calculations carried out by the appellant, the appellant's first approximations were found to be sufficiently accurate to substantiate the alleged lack of novelty of the

subject-matter of the granted claim 1. However, in order to allow forming of a more complete picture of the disclosure of D1, the appellant was invited to provide a translation of the missing pages 195 and 198 to 209.

VI. With letter dated 13 September 1999 the appellant filed pages 195 to 211 of D1 translated into the German language.

VII. Oral proceedings were held on 21 December 1999.

The appellant requested setting aside of the decision under appeal and revocation of the patent in its entirety.

During the oral proceedings the respondent filed new claims 1 and 2 and an adapted patent description, pages 3 to 9. The respondent requested that the patent be maintained in amended form on the basis of these new documents together with the granted figures 1 to 4.

Claim 1 reads as follows:

"1. A mandrel mill for rolling tubing capable of preventing stripping miss, comprising:

(a) not less than three serially arranged roll stands (1) and a final stand (1) wherein each roll stand comprises a pair of grooved rolls (2, 2') whose grooves are paired so that each pair of grooved rolls (2, 2') and an arc in the zone between each grooved roll (2, 2') of the pair of grooved rolls (2, 2') defines a hole, the arc being defined by the outer

circumference of the tubing, and the roll stands (1) define a serial arrangement of said paired grooves; and

(b) a mandrel bar (3) disposed in and extending through said serial arrangement in a spaced relationship with said grooved rolls (2, 2'), the mandrel bar (3) and the rolls (2, 2') defining there between a region for rolling tubing; wherein

the hole defined by the first stand (1) has a circumference of not less than 1.12 times the outer circumference of the tubing at the exit of the final stand (1), the circumference of the hole defined by the second stand (1) is not less than 1.06 times said outer circumference, and the circumference of the hole defined by the third stand (1) is not less than 1.02 times said outer circumference; and in that the hole circumference is formed by first to third circular arcs (R_1, R_2, R_3), the first of which (R_1) extends from the bottom of one of said grooves and has a center of curvature which lies below the center of said hole, namely the pass center, relative to said groove."

VIII. In support of its requests the appellant essentially relied upon the following submissions:

When compared to the granted claim 1 the current claim 1 comprised features relating to the eccentricity of the hole formed by the caliper groove which did not have an antecedent in the description as it was originally filed. Although the originally filed Figure 2 showed an eccentricity, neither the function nor the effects aimed at were apparent to the skilled person. Therefore, since eccentricity was not derivable

as a significant feature from the originally filed application documents, the introduction of this feature into the claim introduced novel subject-matter and as a consequence the amended claim did not fulfill the requirements of Article 123(2) EPC.

Even if the claim were held formally admissible its subject-matter lacked an inventive step when having regard to the prior art disclosed in D1. This prior art already emphasised the problems encountered in respect to material flow during rolling and in particular the material flow-effects when using an ovally shaped caliper in relation to the issue of stripping miss. In respect of the latter issue D1 already disclosed in the example disclosed in relation to Figure 75 and Table 36 hole circumference ratios of the first three stands falling into the claimed ranges. It would further be obvious to the skilled person to include eccentricity in these known calipers in accordance with the second example shown in Figure 71 of D1 if the material flow properties should be improved. As a consequence, the obvious further development of the known mandrel mill as defined in the amended claim 1 did not fulfill the requirements of patentability in respect of inventive step.

IX. The respondent disputed the appellant's view and its arguments may be summarised as follows:

The eccentricity of the hole formed by the caliper groove was clearly derivable from the drawings of the originally filed application documents and, although no direct reference was given in the description it was clear from the use of different references for the

height (B) of the caliper and the first circular arc radius (R_1) that these parameters were different and constituted an implicit disclosure of the eccentricity now claimed.

The claimed subject-matter concerned a combination of features with which it was possible to produce high alloy steel tubing without having mandrel stripping problems. In particular the combination of the hole circumference values of the first three stands and the eccentricity of the caliper hole, which itself was made up from circular arcs, led to material flow properties during rolling which proved to be particularly advantageous for producing high alloy steel tubing which was particularly prone to stripping miss problems.

In respect of the material flow properties D1 essentially addressed optimizing of the ratio between the caliper width and height which was the crucial parameter in all three caliper shapes shown in Figure 71 of D1 and no disclosure or suggestion was derivable from D1 to combine features from these different examples with each other to improve material flow further. Moreover, although D1 also addressed the issue of stripping miss, no teaching was given as regards the ratio of hole circumferences of the first three stand calipers with respect to the hole circumference of the last stand calipers. Therefore, the skilled person could not be lead in an obvious manner by the teachings of D1 to the subject-matter of the amended claim 1.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 The current claim 1 is based on the granted claim 1 but now further specifies that the hole circumference is formed by first to third circular arcs, the first of which extends from the bottom of the groove and has a center of curvature which lies below the center of the hole relative to the groove.

This subject-matter is based on the originally filed claim 1 and the originally filed detailed description of the preferred embodiment of the mandrel mill disclosed in relation to Figures 1 and 2. Since it is further limited when compared to the subject-matter of the granted claim the requirement of Article 123(3) EPC are satisfied.

2.2 The appellant considered that although Figure 2 showed an eccentric position of the center of the first arc and the center of the caliper, in the absence of any disclosure in the description of the function or technical effect aimed at, incorporation in the claim of such a detail disclosed solely in the drawings would infringe the requirements of Article 123(2) EPC.

In this respect, the Board draws attention to the case law of the Boards of appeal (see T 169/83, OJ 1985, 193) according to which the EPC does not prohibit amendment of claims to include features from drawings, provided that the structure and the function of such

features were clearly, unmistakably and fully derivable from the drawings by the skilled person and not at odds with the other parts of the disclosure.

Considering the feature of eccentricity added to the granted claim 1 it is clearly shown in Figure 2 that the first circular arc has a center of curvature which lies below the center of the caliper hole, namely the pass center. In so far the structure of the additional feature is unmistakably derivable from the originally filed Figure 2.

As regards the function of the eccentricity, the Board holds the view that the skilled person acquainted with mandrel mills is well aware of the possibilities to influence the directions of material flow during rolling. In this respect attention can be drawn to D1 in which there is stated (see the third paragraph of point 19 on page 193/194 of the translation provided by the appellant) that, when compared to other caliper shapes, an oval caliper is suitable for intensifying the lateral flow of the material during rolling.

This background knowledge enables the skilled person to interpret the rolling process steps shown in the different stands of Figure 1 of the patent in suit. As is clearly derivable from the details disclosed in the drawings relating to the different stands, the eccentric shape of the caliper functions in similar manner to the oval caliper and forces the material to flow also in the lateral directions during rolling. Therefore, also the function of the eccentricity is clearly and unambiguously derivable by the skilled person from the original disclosure of the patent.

Since the structure and function of the eccentricity derived from the drawings by the skilled person is fully in line with the rest of the disclosure of the original patent application, in particular with the detailed description of the preferred embodiment of the invention which, in the formulas for calculation of the caliper groove circumference, already takes account of a difference between the radius of the first circular arc (R_1) and the total height of the caliper groove (B), the conditions stipulated in T 169/83 as referred to above are satisfied. Therefore the Board is of the opinion that the subject-matter of claim 1 does not give rise to objections of lack of disclosure or support in the originally filed application documents (Article 123(2) and 84 EPC).

2.3 Claim 2 is a repetition of the granted and originally filed claim 2, respectively.

The description was amended to bring it in line with the amended claim 1 and to acknowledge the closest prior art represented by D1. These amendments also do

not give rise to objections under Article 123(2) or 84 EPC.

2.4 It is to be noted that the closest prior art represented by D1 comprised an example with hole circumference ratios falling in the claimed ranges (the example of Figure 75 and Table 36). However, since no general teaching can be derived from D1 to a sequence of ratio ranges as claimed in the patent in suit it is not considered appropriate in the present case to use the two part form of claim (Rule 29(1) EPC).

3. *Novelty*

Novelty of the subject-matter of claim 1 follows from the fact that the available prior art does not disclose a mandrel mill with not less than three serially arranged roll stands and a final roll stand in which each of the calipers have a hole circumference formed by three circular arcs, the first arc extending from the bottom of the groove and having a center of curvature which lies below the pass center.

Novelty was in fact no longer contested in respect of the amended claim 1.

4. *Inventive step*

4.1 The parties and the Board are in agreement that the disclosures in book D1 represent the closest prior art, in particular the example disclosed in relation to Figure 75 and Table 36, which example is based on the caliper shape shown in the second embodiment of Figure 71 having a groove circumference made up from

three circular arcs ($R_1=d_k/2$, $R_2=ñ$ and R_3 which is named R_1 in that Figure).

The example in accordance with Figure 75 and Table 36 relates to a mandrel mill for rolling tubing capable of preventing stripping miss. The mandrel mill comprises eight serially arranged roll stands and a final stand wherein each roll stand comprises a pair of grooved rolls whose grooves are paired so that each pair of grooved rolls defines a groove, the arc of the groove being defined by the outer circumference of the tubing and the roll stands define a serial arrangement of said paired grooves. The hole circumference of each groove is formed by first to third circular arcs (R_1, R_2, R_3). A mandrel bar is disposed in and extending through said serial arrangement in a spaced relationship with said grooved rolls and the mandrel bar, and the rolls define there between a region for rolling tubing.

4.2 Since the shape of the hole is entirely determined by the parameters shown in Figure 71 and specific values for these parameters concerning the example of Figure 75 are given in Table 36, accurate calculations can be carried out to determine the ratio of groove circumference of each stand with respect to the last stand.

As was shown by the appellant, the ratios of the first three stands with respect to last stand of the example disclosed in D1 are 1.15, 1.12 and 1.08 respectively and therefore fall within the ranges defined in claim 1, i.e. not less than 1.12, not less than 1.06 times and not less than 1.02, respectively.

4.3 D1 addresses the problem of "stripping miss" (the mandrel bar and the tubing are stuck together making it impossible to withdraw the mandrel from the tubing) when rolling tubing in a mandrel mill. From pages 193 and 194 of the translation follows that each of the three caliper shapes shown in Figure 71 have their specific advantages and disadvantages in respect of achieving accurate geometrical dimensions of the rolled tubing or ease of withdrawal of the mandrel from the tubing after rolling in the last stand.

The present patent is also directed towards overcoming the problem of stripping miss in a mandrel mill, in particular when rolling of high-alloy steel tubing is concerned. The object of the present patent is to assure the formation of an appropriate clearance between the mandrel bar and the tubing material (see page 4, lines 28 to 30 of the patent in suit).

4.4 This problem is solved by the mandrel mill in accordance with the present patent by the features of claim 1, in particular by specifying lower limits of the ratio of the hole circumferences of the calipers of the first three stands with respect to the last stand and the eccentric position of the center of curvature of the first circular arc of the groove.

In accordance with the explanations submitted by the respondent these features lead to accurate dimensions of the tubing and avoidance of stripping miss because of the combination of specific limits for the ratios of the hole in the stands and improved flow properties achieved by the eccentric position of the caliper hole.

4.5 Although D1 addresses the influence of the different shapes of the calipers shown in Figure 71 on the accuracy of the rolled tubing and avoidance of stripping miss, the teaching derivable from D1 in respect of avoidance of stripping miss is essentially directed to an optimal selected ratio between the caliper's hole width and height (see the translation of D1, middle of page 202/203), together with an elongation between the stands in the range of 0.5 to 1%, as well as a compression in the last stands not exceeding 1% (see the translation of D1, middle of page 204/205).

D1 further suggests to select the angles for the bevelled edges of the caliper so as to improve the lateral flow of material during rolling.

4.6 In contrast thereto the mandrel mill in accordance with amended claim 1 of the patent in suit relies on specific limits of the ratio of the hole circumferences of the calipers of the first three stands with respect to the last stand together with the eccentric position of the center of curvature of the first circular arc of the hole.

Although, as is indicated above, D1 points at measures for avoidance of stripping miss, it does not address the caliper hole circumference ratios of the first three stands with respect to the last stand, which ratios do not have a direct relation with the limits for elongation suggested in D1. Therefore the skilled person is not led by the teaching of D1 to determine minimum values for these ratios of the first three stands in a mandrel mill having calipers of the shape

corresponding to the example disclosed in relation to Figure 75 and Table 36.

D1 also refers to intensifying of lateral flow of material during rolling but this teaching is related to the use of oval calipers (see the translation of D1, page 193/194, third paragraph). In the third paragraph on page 194 of the translation reference is made to the specific advantages and disadvantages achieved when using circular or oval calipers and that for these reasons the trend is to combine different caliper shapes. However, in the absence of any indication of what specific caliper shape details should be combined, no specific direction of further development can be derived from this disclosure of D1.

4.7 The appellant argued that the ranges claimed in claim 1 were very large and, as was apparent from the embodiment of Figure 75 and Table 36 of D1 leading to caliper hole circumference ratios falling within these ranges, did not show any inventive significance. Furthermore, D1 already disclosed the advantages of the oval shape of caliper when lateral flow of material was concerned. Therefore the mandrel mill claimed in claim 1 was nothing more than an obvious further development of the mandrel mill shown in the example of D1 and for this reason was not patentable.

It is true that the ranges claimed are open in the direction of larger ratios and as such the ranges claimed appear very broad. However, it is considered to be obvious to the skilled person that further practical limitations are placed on these values because a geometrically and structurally sound tubing can only be

produced within reasonable limits of the ranges. The teaching of the ranges of claim 1 in accordance with the amended patent should therefore be seen in the limitation of ratios fixed by the lowest values of the ranges thereby determining a series of minimum caliper hole circumference ratios that is required to avoid stripping miss when using a range of stands with calipers in which the hole is formed by first to third circular arcs and in which the first arc has a center of curvature which lies below the center of the groove. In respect of improved lateral material flow during rolling when using oval calipers, D1 does not disclose that this would be of interest in the embodiments of the other calipers shown in Figure 71, because, in so far as hole shape is concerned, the teaching of D1 is essentially directed to an optimal width/height ratio of the caliper hole which should be observed for each embodiment of caliper shape.

Therefore D1 fails to disclose or suggest to the skilled person the specific combination of the use of calipers with a hole circumference formed by three circular arcs, the eccentric displacement of the first circular arc of the calipers of the first three rolling stands when compared to the caliper of the last stand together with the groove circumference ratios of the calipers in the first three stands so as to improve the formation of an appropriate clearance between the mandrel bar and the tubing material thereby preventing stripping miss or scratch formation on the inner surface of the tubing due to insufficient clearance during stripping.

4.8 Therefore, in the absence of any teaching in the available prior art in the direction of the proposed solution to the problem underlying the subject-matter of the current claim 1 of the patent in suit the solution defined in this claim is considered to be based on an inventive step.

5. In conclusion, claim 1 as well as its dependent claim 2 relating to a particular use of the subject-matter of claim 1 can form the basis for maintenance of the patent in amended form (Article 52(1) EPC).

The description and drawings are in agreement with the wording and scope of the current claims. Hence these documents are also suitable for maintenance of the patent in amended form.

Thus taking into account the amendments made by the respondent, the patent and the invention to which it relates meet the requirements of the EPC and the patent

as amended may be maintained in this form (Article 102(3) EPC).

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:

Claims: 1 and 2, together with the description submitted at the oral proceedings of 21 December 1999,

Drawings: (Figures 1 to 4) as granted.

The Registrar: The Chairman:

S. Fabiani F. Gumbel