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D E C I S I O N
of 17 March 1998

Case Number: T 0189/96 - 3.2.1

Application Number: 91303487.2

Publication Number: 0455382

IPC: B21B 37/02, G05B 15/02

Language of the proceedings: EN

Title of invention:
Method for controlling gage in a metal rolling mill

Patentee:
Allegheny Ludlum Corporation, et al

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 56, 104

Keyword:
"Inventive step (no)"
"Apportionment of costs (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0189/96 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 17 March 1998

Appellant: (Opponent)
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Representative:
-

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 21 December 1995 rejecting the opposition filed against European patent No. 0 455 382 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: F. A. Gumbel
Members: P. Alting van Geusau
V. Di Cerbo

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 455 382 in respect of European patent application No. 91 303 487.2, filed on 18 April 1991, and claiming priority from US application No. 517 266 filed on 1 May 1990 in the United States of America, was published on 2 March 1994.

Claim 1 of the patent reads as follows:

"1. A method for controlling metal thickness in a metal rolling mill having at least two rolling stands (1, 2), each roll stand having at least one pair of opposed workrolls (3,4; 5,6) for reducing the thickness of a metal workpiece (18) passed therebetween, thickness sensing means (7) for sensing strip thickness between adjacent stands, means (11, 12) for sensing the rolling speed of each stand, and main drive control means (13, 14) for controlling the main drive motor speed and armature current, the method comprising:
(a) measuring strip thickness in successive increments of strip length passing between the first upstream stand (1) and the second downstream stand;
(b) as each successive increment of strip arrives at the second stand, establishing a first control signal (V2r)* as a function of the second stand speed, the speed references of the first and second stands, and the strip thickness measurements;
(c) as each successive increment of strip arrives at the second stand, establishing a second control signal proportional to the difference between the measured speed of the first stand and said first control signal; and
(d) changing the first stand speed as a function of the second control signal."

* (V2r) should read (V1r)

II. Notice of opposition was filed on 2 December 1994 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 document

D1: US-A-4 292 825

III. By decision dated 21 December 1995 the Opposition Division rejected the opposition.

The Opposition Division was of the opinion that, when compared to the metal rolling method known from D1, the method of claim 1 of the patent in suit was novel because the basis on which the control signals were established was different. The claimed method also comprised an inventive activity because D1 did not lead the skilled person to the specific parameters of control either.

IV. On 20 February 1996 a notice of appeal was lodged against that decision together with payment of the appeal fee. The statement of grounds of appeal was filed on 22 April 1996.

V. In a communication issued in preparation of oral proceedings, requested by the respondent (patent proprietor), the Board expressed the provisional opinion that document D1 appeared to be more relevant than considered by the Opposition Division, in particular since the control method disclosed in D1 appeared to be based on the same parameters as those defined in claim 1 of the patent in suit.

VI. Oral proceedings were held on 17 March 1998. The respondent who had informed the Board with letter dated 4 July 1997 of its intention not to appear did not attend the oral proceedings.

In addition to its request for revocation of the patent in its entirety, the appellant requested an apportionment of costs incurred in the oral proceedings.

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

In its present very general definition the control method claimed in claim 1 was essentially known from D1. In fact claim 1 did not indicate more than that the control was in accordance with the law of constancy of mass flow through the rolling mill. A difference could perhaps be seen in the manner of establishing the first control signal to be a function of a limited number of variables whereas in D1 the comparative signal was a function of more variables, including the first stand speed. However, such presently not sufficiently clearly defined difference could not render the claimed method inventive since it did not go beyond a simple optimisation procedure carried out by the skilled person during the setting-up procedure of the control with a view to simplify the control.

In the present case it was only the respondent who had auxiliarily asked for oral proceedings. With letter dated 4 July 1997 the respondent informed the appellant that he would not attend the oral proceedings arranged by the Board but the request for oral proceedings was not withdrawn. Since the proceedings could in fact have been continued in writing, the oral proceedings were superfluous and led to unnecessary costs for the appellant. Under these circumstances apportionment of costs incurred in the oral proceedings in the appellant's favour was justified.

VIII. The respondent in its letter dated 23 August 1996 requested rejection of the appeal. In support of this request reference was made to the previous submissions made in response to the opposition with letter 10 May 1995 which was attached. The respective arguments may be summarised as follows:

The method claimed in claim 1 was distinguishable from the method disclosed in D1 for several reasons. D1 was directed to a system for controlling both gauge and tension in a tandem mill, but it did not disclose an entry end feed-forward gauge control system. Although D1 uses some of the same parameters such as tension, speed and gauge signals as did most process control systems it did not calculate the instantaneous desired speed of the upstream stand as a function of the actual speed of the downstream stand, the planned speeds of both stands, the strip thickness of the strip increment arriving at the downstream stand, and its thickness change from the initial strip thickness.

With respect only to the mass flow aspects of entry end gauge control systems, prior art feed-forward systems had recognised the need to correct stand speed 1 for the mass flow disturbances associated with strip gauge variations arriving at stand 2 but none has recognised the need to correct stand 1 speed 2 speed disturbances caused by the feed-forward control in the absence of perfect tension regulators. The prior art had also not anticipated the need to make these regulations faster than can be achieved with most conventional speed regulators. In contrast thereto the method in accordance with the patent allowed fast speed regulation by directly acting on stand 1 current control, not the speed control, to force stand 1 speed to follow the new reference.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

2.1 When considering the technical content of claim 1 of the patent in suit, D1 represents the closest prior art.

This document discloses a gauge and tension control system for tandem rolling mill having at least two rolling stands, each roll stand having at least one pair of opposed workrolls 11, 12 for reducing the thickness of a metal workpiece passed therebetween, thickness sensing means 42 for sensing strip thickness between adjacent stands, means 51, 52 for sensing the rolling speed of each stand and main drive control means for controlling the main drive motor speed and armature current (see Figure 4).

As can further be derived from the functioning of this known control (see also column 7, lines 49 to 57 and column 8, lines 27 to 37), strip thickness is measured in successive increments of strip length passing between the first upstream stand and the second downstream stand (feature (a) in claim 1 under consideration) and as each successive increment of strip arrives at the second stand control signals for changing the first stand speed are established.

Considering the control circuit disclosed in D1 more in detail, it can be derived from Figures 1, 2 and 3, that the signal coming from adder 821 is a combination of signals coming from the speed matching controller 810 and the D/A converter 840. Figure 3 shows that speed matching of the stands is essentially based upon input signals representing the sensed stand speeds (51 to

5n), the sensed motor current (detection 71 to 7n), which is a measure for the motor torque, and the desired rolling speed value ω_R. More specifically, the signal coming from adder 821 (see Figure 2) is the sum of the signals from the speed matching controller 810 and the signal coming trough the D/A converter 840 from the optimal control unit 100, which unit outputs signals based on signals from the schedule computer 140, the delivered thickness deviation calculation unit 120 (calculated on the basis of thickness sensor signals), the tension calculation unit 130 and the memory unit 110.

Therefore the signal coming from the optimal control unit and entering the speed controller 80 through the D/A converter 840 must be considered to be at least a function of the strip thickness and speed reference ω_R whereas the signal ω_{01} (see Figures 3 and 2) entering the adder 821 is at least a function of the stand speeds ω_1 and ω_2 in case of a tandem rolling mill having two stands.

In view of the fact that the desired command value ω_R (see Figure 3 and column 9, line 26) contains information of desired command values for each mill stand (see column 9, lines 25 to 28), it follows that also the speed reference ω_R is not just one value but comprises the information of scheduled speed references for each mill stand.

Therefore, in case of a rolling mill having two stands the control signal entering the motor controller 831 is a function of the first stand speed, the second stand speed, the speed references of the first and second stands and the strip thickness measurements (see feature (b) of claim 1).

With reference to Figure 4, showing the motor controller, it can be derived that the signal entering the speed controller 600 is established on the basis of the signal coming from the adder 821 and the sensed motor speed signal which is a measure of the first stand speed. The functioning of such an arrangement amounts to a control method in accordance with features (c) and (d) of claim 1 of the patent in suit.

2.3 When comparing the method known from D1 to the method claimed in claim 1 of the patent in suit, the single remaining difference is to be seen in a more limited number of parameters used for establishing the first control signal in the method of claim 1, i.e. the second stand speed, the speed references of the first and second stands and the strip thickness measurements (thus the first stand speed is left out).

Therefore the subject-matter of claim 1 is considered novel within the meaning of Article 54 EPC.

2.4 The respondent disputed that D1 disclosed an entry feed-forward gauge control system and that in this known method the instantaneous desired speed of the upstream stand was not calculated as a function of the actual speed of the downstream stand, the planned speeds of both stands, the strip thickness of the strip increment arriving at the downstream stand, and its thickness change from the initial strip thickness.

In this respect the Board explained in its communication for the preparation of the oral proceedings in detail which features claimed in claim 1 of the patent in suit were in combination derivable from D1 when having regard to the known gauge control

method exemplified by the preferred embodiment disclosed in relation to Figures 1 to 4 in D1 and in particular why such method should be considered an entry feed-forward gauge control system.

The respondent did not dispute the Board's findings in this respect.

3. *Inventive step*

3.1 When starting from the prior art method disclosed in D1 the technical problem to be solved by the method claimed in claim 1 can be seen in further optimisation of the known gauge control method (see also column 1, lines 33 to 35 of the patent in suit).

3.2 When applying the teaching of D1 to a tandem rolling mill with two stands, a configuration already anticipated by D1 (see column 2, line 51), the skilled person is well aware of the possibilities of simplification and optimisation of the control of such a tandem mill when compared to the control of a tandem rolling mill having a greater number of mill stands.

In particular, when having regard to the speed of the first stand it is considered to be obvious that this parameter is not decisive in establishing the first control signal because the first stand speed is taken into account in the further signal processing steps of the control of the first stand speed (see Figure 4 of D1).

As was also submitted by the appellant in the oral proceedings, further testing of the control will be normally carried out during the test-phase of the

tandem mill. It is customary practice to further simplify the control when a limited number of parameters suffices for establishing the first control signal.

Therefore the simplification by omitting the first stand speed in the assessment of the first control signal cannot be seen to involve an inventive activity.

3.3 In support of inventive step of the subject-matter of claim 1 the respondent submitted that the transient disturbances needed corrections faster than could be achieved with most conventional speed regulators and that therefore the control acted directly on stand 1 current control and not the speed control to force stand 1 speed to follow the altered reference (see page 4, first paragraph of the statement of grounds of appeal).

However, nothing in claim 1 indicates such particular motor speed control.

Indeed, a further specification of the second control signal to incorporate a current reference modifier for control of the main drive motor is the subject of the dependent claim 3 but cannot be regarded to restrict the scope of claim 1 to the specific armature current control.

3.4 It is to be noted that the embodiment of the method for controlling metal thickness in a metal rolling mill disclosed in the patent in suit essentially concerns a conventional control system to which an additional current reference modifier is added (see column 4, lines 8 to 16 and Figure 2 of the patent in suit). Even considering that in accordance with Article 69(1) EPC the description and drawings shall be used to interpret the claims, the method of claim 1 of the

patent in suit is defined in such general terms that it must be interpreted to embrace possibilities not restricted to only the combination of two control circuits in the manner as shown in Figure 2 of the patent in suit.

Therefore, in the absence of any factual or implied limitation of the subject-matter of claim 1 to the specific embodiment disclosed in the patent, the respondent's arguments for support of inventive step based on such limitation cannot be taken into account when assessing inventive step of the method of claim 1.

3.5 Summarising, the Board is of the opinion that, when having regard to the disclosures of D1 and the abilities of the skilled person to simplify the control method disclosed in D1, the method of claim 1 of the patent in suit lacks an inventive step within the meaning of Article 56 EPC. Therefore the patent cannot be maintained in its granted form and consequently the appellant's request for revocation of the patent is accepted.

4. *Request for apportionment of costs*

4.1 The appellant requested apportionment of costs in its favour essentially because the oral proceedings, requested by the respondent but not attended by him, was considered unnecessary.

4.2 The Board observes that the respondent informed the Board and the appellant of its intention not to appear already in July 1997. The appellant was therefore given sufficient time to request cancellation of the oral proceedings if he considered them unnecessary.

Moreover, the Board draws attention to the fact that the appellant's initial attack on claim 1 of the patent in suit was exclusively based on arguments relating to the law of constant mass flow whereas in the oral proceedings the appellant essentially focussed on the control method steps disclosed in D1. It was only in the oral proceedings that the remaining differences of the claimed method vis-a-vis the method derivable from D1 were addressed and arguments were presented why these differences were obvious to the skilled person.

In view of these circumstances the Board cannot accept the appellant's allegation that the oral proceedings have proved unnecessary. There is thus no reason of equity to depart from the general principle that each party shall meet the costs he has incurred.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

3. The request for apportionment of costs is rejected.

The Registrar: The Chairman:

S. Fabiani F. Gumbel