Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 13 April 2021

Case Number: T 1668/17 - 3.2.03

Application Number: 09704554.6

Publication Number: 2241383

IPC: B21B27/02, B21B27/00

Language of the proceedings: EN

Title of invention:
ROLLING MILL, AND TANDEM ROLLING MILL HAVING THE SAME

Patent Proprietor:
Mitsubishi-Hitachi Metals Machinery, Inc.

Opponent:
SMS group GmbH

Headword:

Relevant legal provisions:
EPC Art. 54, 56, 111(1)
RPBA Art. 12(4)
RPBA 2020 Art. 13(2), 11

Keyword:

Amendment after summons - exceptional circumstances (yes) - main request - taken into account (yes)
Late-filed objections of lack of inventive step - based on alleged novelty destroying document - admitted (yes) - remittal (no)
Main request - novelty (yes) - inventive step (no)
Late-filed auxiliary requests - admitted (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1668/17 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 13 April 2021

Appellant: (Patent Proprietor)	Mitsubishi-Hitachi Metals Machinery, Inc. 34-6, Shiba 5-chome Minato-ku Tokyo 108-0014 (JP)
Representative:	Strehl Schübel-Hopf & Partner Maximilianstrasse 54 80538 München (DE)
Respondent: (Opponent)	SMS group GmbH Eduard-Schloemann-Strasse 4 40237 Düsseldorf (DE)
Representative:	Klüppel, Walter Hemmerich & Kollegen Patentanwälte Hammerstraße 2 57072 Siegen (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 18 May 2017 revoking European patent No. 2241383 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	G. Patton
Members:	R. Baltanás y Jorge
	D. Prietzel-Funk

Summary of Facts and Submissions

I. European patent No. 2 241 383 relates to a rolling mill.

II. An opposition was filed against the patent based on Article 100(a) EPC together with Articles 54 and 56 EPC, Article 100(b) EPC, and Article 100(c) EPC.

III. During the opposition proceedings, the patent proprietor requested maintenance of the patent in amended form according to a main request filed with a letter dated 22 March 2017 ("**MRo**") or according to one of the first to fifth auxiliary requests filed with the same letter.

IV. The opposition division decided to revoke the patent on the grounds that:

the subject-matter of claim 1 of the then main request (MRo) lacks novelty in view of D1

the subject-matter of claim 1 of the then first auxiliary request does not involve an inventive step with regard to the combination of D1 with the common general knowledge

the subject-matter of claim 1 of the then second to fifth auxiliary requests does not involve an inventive step with regard to the combination of D1 with D10 or D13

Hence, the opposition division revoked the patent.

V. This decision was appealed by the patent proprietor ("appellant").

VI. With its statement setting out the grounds of appeal, the appellant stated that "*The **main request** as filed with letter of March 22, 2017 is maintained*", i.e. MRo (see point 1). However, a new main request was annexed ("**MRs**") which did not correspond to MRo. New auxiliary requests I to IV were also annexed to the statement setting out the grounds of appeal.

VII. In a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA) 2020, the Board indicated its preliminary opinion on the case that MRs and auxiliary requests I to IV would likely not be admissible.

VIII. With a letter dated 27 January 2021, the appellant "*confirms its intention to maintain the as filed with the letter of March 22, 2017 (L2) and herewith submits a copy of said main request*" ("**MRo'**"). New auxiliary requests Ia-IVa and Ib-IVb were also filed and annexed to the same letter.

IX. In the absence of any objection from the parties, oral proceedings were held by videoconference (Zoom platform) on 13 April 2021.

X. Requests

The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the main request filed with the letter dated 27 January 2021 (MRo'); auxiliary requests Ib to IVb or Ia to IVa, all filed with the letter dated 27 January 2021; or

auxiliary request I to IV submitted with the statement setting out the grounds of appeal (in this order).

The opponent ("respondent") requested that the appeal be dismissed.

XI. Claim 1 of the main request (MRo'; corresponding to MRo), including the numbering of its features as adopted by the parties, reads as follows:

1. *A six-high rolling mill including*

1.1 *upper and lower work rolls (2) as a pair for rolling a metal strip (1),*

1.2 *upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and*

1.3 *upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),*

1.4 *the six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (2), wherein*

1.1.1 *the upper and lower work rolls (2) use a material having a high modulus of longitudinal elasticity which is 1.2 to 3.0 times the conventional elasticity of 21.000 kg/mm^2, characterized in that*

1.1.2 *a minimum roll diameter of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

*minimum diameter upper limit Dmax1 = D4max*B/ K$^{(1/4)}$*

and

*minimum diameter lower limit Dmin1 = D4min*B/ $K^{(1/4)}$*

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm, is 380 mm,
B is the strip width in mm/1,300 mm,
K = 1.2 to 3.0, and wherein K is the ratio for modulus of longitudinal elasticity of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity of high longitudinal modulus material/modulus of longitudinal elasticity of conventional material which is 21,000 kg/mm^2,
D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.

XII. Claim 1 of the request attached as the "main request" to the statement setting out the grounds of appeal (MRs), including the numbering of its features as adopted by the parties, reads as follows (amended features with respect to MRo'/MRo are marked in bold, and deleted features are in strikethrough; emphasis by the Board):

1. *A six-high rolling mill including*
1.1 *upper and lower work rolls (2) as a pair for rolling a metal strip (1),*
1.2 *upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and*
1.3 *upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),*

1.4 *the six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (2), wherein*

1.1.1 ~~***the upper and lower work rolls***~~ ***the work roll*** *(2) use**s** a material having a high modulus of longitudinal elasticity which is 1.2 to 3.0 times the conventional elasticity of 21.000 kg/mm^2, characterized in that*

1.1.2 *a minimum roll diameter of* ~~***each of the upper and lower work rolls***~~ ***the work roll*** *(2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

*minimum diameter upper limit Dmax1 = D4max*B/K$^{(1/4)}$*

and

*minimum diameter lower limit Dmin1 = D4min*B/K$^{(1/4)}$*

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm, is 380 mm,
B is the strip width in mm/1,300 mm,
K = 1.2 to 3~~***.0***~~*, and wherein K is* ~~***the***~~ *ratio for modulus of longitudinal elasticity of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity of high longitudinal modulus material/modulus of longitudinal elasticity of conventional material which is 21,000 kg/mm^2,*

D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.

XIII. Claim 1 of auxiliary request Ib reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1), upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3), the six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (2),*

characterized in that the upper and lower work rolls (2) ***are composed of*** *a material having a high modulus of longitudinal elasticity which is 1.2 to 3.0 times the one of 21.000 kg/mm^2 of the conventional material, wherein a minimum roll diameter of each of the upper and lower work roll (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$$\text{minimum diameter upper limit } Dmax1 = D4max \cdot B/K^{(1/4)}$$

and

$$\text{minimum diameter lower limit } Dmin1 = D4min \cdot B/K^{(1/4)}$$

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm is 380 mm
B is the strip width in mm/1,300 mm
K = 1.2 to 3.0, and wherein K is the ratio for modulus of longitudinal elasticity of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity of high longitudinal modulus material/modulus of longitudinal elasticity of conventional material which is 21,000 kg/mm^2,
D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.

XIV. Claim 1 of auxiliary request IIb reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1), upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3), the six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (2),*

characterized in that the upper and lower work rolls (2) ***are integrally made of*** *a material having a high modulus of longitudinal elasticity which is 1.2 to 3.0 times the one of 21.000 kg/mm^2 of the conventional material, wherein a minimum roll diameter of each of the upper and lower work roll (2) is intermediate between a minimum diameter upper limit Dmax1 and a*

minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:

minimum diameter upper limit Dmax1 = D4max·B/K$^{(1/4)}$

and

minimum diameter lower limit Dmin1 = D4min·B/K$^{(1/4)}$

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm is 380 mm
B is the ***rollable*** *strip width in mm/1,300 mm*
K = 1.2 to 3.0, and wherein K is the ratio for modulus of longitudinal elasticity of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity of high longitudinal modulus material/modulus of longitudinal elasticity of conventional material which is 21,000 kg/mm^2,
D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.

XV. Claim 1 of auxiliary request IIIb reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),* ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,*** *upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3), the six-high rolling mill*

having no supporting rolls inside and outside a rollable strip width of the work rolls (2),

characterized in that the upper and lower work rolls (2) ***are integrally made of*** *a material having a high modulus of longitudinal elasticity* ***Er*** *which is 1.2 to 3.0 times the one of 21.000 kg/mm^2 of the conventional material,* ***such that the horizontal deflection δr of the upper and lower work rolls (2) in response to a tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4/(384 \times Er \times Ir)$$

$$\text{wherein } Ir = \pi \times Dr^4 / 64$$

wherein a minimum roll diameter ***Dr*** *of each of the upper and lower work roll (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$$\text{minimum diameter upper limit } Dmax1 = D4max \cdot B/K^{(1/4)}$$

and

$$\text{minimum diameter lower limit } Dmin1 = D4min \cdot B/K^{(1/4)}$$

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm is 380 mm
B is the ***rollable*** *strip width in mm/1,300 mm*
K = 1.2 to 3.0, and wherein K is the ratio for modulus of longitudinal elasticity ***Er*** *of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity* ***Er*** *of high longitudinal*

modulus material/modulus of longitudinal elasticity ***Er*** *of conventional material which is 21,000 kg/mm^2, D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.*

XVI. Claim 1 of auxiliary request IVb reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),* ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,*** *upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2),* ***said upper and lower intermediate rolls (3) being adapted to transmit driving torque to the respective upper and lower work rolls (2) by exerting a tangential driving force F per unit length onto the respective upper and lower work roll (2),*** *and upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3), the six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (2),*

characterized in that the upper and lower work rolls (2) ***are integrally made of*** *a material having a high modulus of longitudinal elasticity* ***Er*** *which is 1.2 to 3.0 times the one of 21.000 kg/mm^2 of the conventional material,* ***such that the horizontal deflection δr of the upper and lower work rolls (2) in response to a tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4/(384 \times Er \times Ir)$$

wherein Ir = π x Dr^4 / 64

*wherein a minimum roll diameter **Dr** of each of the upper and lower work roll (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

minimum diameter upper limit Dmax1 = D4max·B/K$^{(1/4)}$

and

minimum diameter lower limit Dmin1 = D4min·B/K$^{(1/4)}$

wherein D4max, i.e. the minimum diameter upper limit of conventional work roll with strip width of 1,300 mm is 380 mm
B is the rollable strip width in mm/1,300 mm
*K = 1.2 to 3.0, and wherein K is the ratio for modulus of longitudinal elasticity **Er** of high longitudinal modulus material to conventional material, i.e. modulus of longitudinal elasticity **Er** of high longitudinal modulus material/modulus of longitudinal elasticity of conventional material which is 21,000 kg/mm^2,*
D4min, i.e. the minimum diameter lower limit of conventional work roll with strip width of 1,300 mm, is 180 mm.

XVII. Claim 1 of auxiliary request Ia reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

*– upper and lower work rolls (2) **having a predetermined rollable strip width** as a pair for rolling a metal strip (1),*
– upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and
– upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

*the six-high rolling mill having no supporting rolls inside and outside **the** rollable strip width of the work rolls (2),*

*characterized in that the upper and lower work rolls (2) **are composed of** a material having a high modulus of longitudinal elasticity **Er**, wherein a minimum roll diameter **Dr** of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$Dmax1 = \mathbf{380\ mm} \cdot B/K^{(1/4)}$

and

$Dmin1 = \mathbf{180\ mm} \cdot B/K^{(1/4)}$

*wherein B is the **rollable** strip width in mm/1,300 mm; K =1.2 to 3.0, and wherein K = **Er**/**(**21,000 kg/mm^2**)**.*

XVIII. Claim 1 of auxiliary request IIa reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

*- upper and lower work rolls (2) **having a predetermined rollable strip width** as a pair for rolling a metal strip (1),*
- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and
- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

*the six-high rolling mill having no supporting rolls inside and outside **the** rollable strip width of the work rolls (2),*

*(a) characterized in that the upper and lower work rolls (2) **are integrally made of** a material having a high modulus of longitudinal elasticity **Er**, wherein a minimum roll diameter **Dr** of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$Dmax1 = \mathbf{380\ mm} \cdot B/K^{(1/4)}$

and

$Dmin1 = \mathbf{180\ mm} \cdot B/K^{(1/4)}$

*wherein B is the **rollable** strip width in mm/1,300 mm; K =1.2 to 3.0, and wherein K = **Er**/**(**21,000 kg/mm^2**)**.*

XIX. Claim 1 of auxiliary request IIIa reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

– upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),* ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,***
– upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and
– upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that the upper and lower work rolls (2) ***are composed of*** *a material having a high modulus of longitudinal elasticity* ***Er, such that the horizontal deflection δr of the upper and lower work rolls (2) in response to a tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4 / (384 \times Er \times Ir)$$

wherein $Ir = \pi \times Dr^4 / 64$

wherein a minimum roll diameter ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$Dmax1 =$ ***380 mm*** $\cdot B/K^{(1/4)}$

and

Dmin1 = ***180 mm*** *·B/K$^{(1/4)}$*

wherein B is the rollable strip width in mm/1,300 mm; K =1.2 to 3.0, and wherein K = ***Er/(****21,000 kg/mm^2****).*

XX. Claim 1 of auxiliary request IVa reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

- upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),* ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,***
- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), ***said upper and lower intermediate rolls (3) being adapted to transmit driving torque to the respective upper and lower work rolls (2) by exerting a tangential driving force F per unit length onto the respective upper and lower work roll (2),*** *and*
- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that ***each of the work rolls*** *(2)* ***is composed of*** *a material having a high modulus of*

longitudinal elasticity ***Er, such that the horizontal deflection δr of the upper and lower work rolls (2) in response to said tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4 / (384 \times Er \times Ir)$$

$$\text{wherein } Ir = \pi \times Dr^4 / 64$$

wherein a minimum roll diameter ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$$Dmax1 = 380\ mm \cdot B/K^{(1/4)}$$

and

$$Dmin1 = 180\ mm \cdot B/K^{(1/4)}$$

wherein B is the ***rollable*** *strip width in mm/1,300 mm; K =1.2 to 3.0, and wherein K =* ***Er****/(21,000 kg/mm^2).*

XXI. Claim 1 of auxiliary request I reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

- upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),*

- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and

- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that ***the work roll*** *(2)* ***is composed of*** *a material having a high modulus of longitudinal elasticity* ***Er,*** *wherein a minimum roll diameter* ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$Dmax1 = \mathbf{380\ mm} \cdot B/K^{(1/4)}$

and

$Dmin1 = \mathbf{180\ mm} \cdot B/K^{(1/4)}$

wherein B is the rollable strip width in mm/1,300 mm; K =1.2 to ***3,*** *and wherein K =* ***Er****/* ***(****21,000 kg/mm^2****).*

XXII. Claim 1 of auxiliary request II reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

- upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),*

- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and
- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that ***the work roll*** *(2)* ***is integrally made of*** *a material having a high modulus of longitudinal elasticity* ***Er,*** *wherein a minimum roll diameter* ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$Dmax1 = \mathbf{380\ mm} \cdot B/K^{(1/4)}$

and

$Dmin1 = \mathbf{180\ mm} \cdot B/K^{(1/4)}$

wherein B is the rollable strip width in mm/1,300 mm; K =1.2 to ***3,*** *and wherein* $K = \mathbf{Er}/(21{,}000\ kg/mm^2)$.

XXIII. Claim 1 of auxiliary request III reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

- upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for*

rolling a metal strip (1), ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,***
- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), and
- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that ***the work roll*** *(2)* ***is composed of*** *a material having a high modulus of longitudinal elasticity* ***Er, such that the horizontal deflection or of the upper and lower work rolls (2) in response to a tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4 / (384 \times Er \times Ir)$$

$$\text{wherein } Ir = \pi \times Dr^4 / 64$$

wherein a minimum roll diameter ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

$$Dmax1 = 380\ mm \cdot B/K^{(1/4)}$$

and

$$Dmin1 = 180\ mm \cdot B/K^{(1/4)}$$

wherein B is the rollable strip width in mm/1,300 mm; K =1.2 to 3, and wherein K = ***Er****/* ***(****21,000 kg/mm^2****).*

XXIV. Claim 1 of auxiliary request IV reads as follows (amended features with respect to MRo' are marked in bold):

A six-high rolling mill including:

- upper and lower work rolls (2) ***having a predetermined rollable strip width*** *as a pair for rolling a metal strip (1),* ***said upper and lower work rolls (2) being supported by bearings with a predetermined support spacing L,***

- upper and lower intermediate rolls (3) as a pair for supporting the work rolls (2), ***said upper and lower intermediate rolls (3) being adapted to transmit driving torque to the respective upper and lower work rolls (2) by exerting a tangential driving force F per unit length onto the respective upper and lower work roll (2),*** *and*

- upper and lower back-up rolls (4) as a pair for supporting the paired upper and lower intermediate rolls (3),

the six-high rolling mill having no supporting rolls inside and outside ***the*** *rollable strip width of the work rolls (2),*

characterized in that the work roll (2) is ***composed of*** *a material having a high modulus of longitudinal elasticity* ***Er, such that the horizontal deflection or of the upper and lower work rolls (2) in response to said tangential driving force F per unit length can be represented as***

$$\delta r = 5 \times F \times L^4 / (384 \times Er \times Ir)$$

wherein Ir = π x Dr^4 / 64

wherein a minimum roll diameter ***Dr*** *of each of the upper and lower work rolls (2) is intermediate between a minimum diameter upper limit Dmax1 and a minimum diameter lower limit Dmin1, and these parameters are expressed by the following equations:*

Dmax1 = ***380 mm*** *$\cdot B/K^{(1/4)}$*

and

Dmin1 = ***180 mm*** *$\cdot B/K^{(1/4)}$*

wherein B is the rollable strip width in mm/1,300 mm; K =1.2 to 3, and wherein K = ***Er*** */ (21,000 kg/mm^2).*

XXV. State of the art

The following documents have been cited, both in the statement setting out the grounds of appeal and during the opposition proceedings, and are relevant for this decision:

D1: JP 2003-275803 A
D1': Machine translation in English of D1
D2: JP H 10-263627 A
D2': Machine translation in English of D2
D3 DE 102 08 389 A

The respondent has filed the following further document with its response to the statement setting out the grounds of appeal:

D1": Human translation in English of D1

XXVI. The appellant's arguments can be summarised as follows.

(a) Main request (MRo')

Admissibility of the request

The request MRo' was actually filed with the statement setting out the grounds of appeal since MRo was explicitly referred to in point 1 of this document, MRo corresponding exactly to MRo', even if ambiguity existed because another request was erroneously attached as the "main request". The respondent understood correctly that MRo was the valid main request, and it consequently responded to it in its reply to the appeal.

In any case, the appellant corrected the mistake at an early stage by confirming that MRo was the valid main request in filing MRo' corresponding to MRo. This was the proper reaction to the Board raising this issue for the first time in the annex to the summons. The seven months lapse between the reception of the summons and the filing of MRo' was necessary for getting professional advice from different sides on how to better redress this mistake. The admission of MRo' into the procedure does not require any extra effort since the matter was already discussed by the respondent. The correction of this obvious error is thus allowable given the exceptional circumstances of the case.

Novelty

The subject-matter of claim 1 is novel with regard to D1 since this document does not disclose features 1.1.1 and 1.1.2, in particular in view of the composite construction of the work rolls of D1 and the limited reference to D2 in paragraph <0013> of document D1".

Inventive step

The lines of attack against inventive step of the claimed invention based on combinations starting from D1 as the closest prior art should not be admitted into the proceedings since these have been raised for the first time during the oral proceedings before the Board.

If these lines of attack are admitted into the proceedings, the case should be remitted to the department of first instance as they open a new discussion about the criteria for the selection of ranges of the minimum diameter of the work rolls. This would require a proper preparation.

In any case, the invention involves an inventive step when starting from D1. There would have been no incentive for the skilled person to consider the claimed range.

(b) Auxiliary requests Ib-IVb, Ia-IVa and I-IV

The requests Ib-IVb and Ia-IVa should be admitted into the proceedings since they correspond in substance to sets of claims filed with the statement setting out the grounds of appeal, i.e. requests I-IV. The auxiliary requests are convergent and represent a legitimate reaction to

the erroneous and surprising finding of the opposition division that the work rolls of the claimed rolling mill can be a composite roll. The reasons for this finding could only be ascertained when reading the contested decision.

XXVII. The respondent's arguments can be summarised as follows.

(a) Main request (MRo')

Admissibility of the request

The request MRo' should not be admitted for being late-filed. The arguments about an alleged clerical error in the request MRs actually filed with the statement setting out the grounds of appeal are not plausible since MRs is actually dealt with in this statement. Moreover, the summons was issued on 5 June 2020, whereas the correction of the alleged error took place only seven months later. This speaks against the presence of such an error. Finally, the reply of the respondent cannot be used to establish the valid request of the appellant since this is the exclusive competence of the appellant itself.

The main request MRo' is new and not *prima facie* allowable. It should thus not be admitted under Article 13(2) RPBA 2020.

Novelty

The subject-matter of claim 1 is not novel with regard to D1. Claim 1 does not exclude the use of a composite roll such as the one of D1. Paragraph

<0013> of D1" incorporates by reference the work roll of paragraph [0012] of D2, which discloses a width between 300 and 1500 mm. The assumption that the roll mill of D1 encompasses a strip width of 1300 mm is thus justified.

Inventive step

Lines of inventive step attack starting from D1 are admissible since they amount to an appropriate reaction to the acknowledgement of novelty by the Board. This cannot be a surprise for the appellant as it concerns documents and arguments already presented before the departments of first and second instance.

These objections should be handled by the Board without remitting the case to the opposition division to avoid an unreasonable delay of the proceedings.

The subject-matter of claim 1 would have been obvious in view of the combination of D1 with either the common general knowledge of the skilled person or document D2 or D3.

(b) Auxiliary requests Ib-IVb, Ia-IVa and I-IV

These requests should not be admitted into the appeal proceedings since they could and should have been filed during the opposition proceedings. Furthermore, they are not *prima facie* allowable and give rise to new issues not discussed during the opposition proceedings.

Reasons for the Decision

1. Main request (MRo')

1.1 Admissibility

Pursuant to Article 13(2) RPBA 2020, any amendment to a party's case made after notification of a summons to oral proceedings shall, in principle, not be taken into account unless there are exceptional circumstances justified by the party concerned.

1.1.1 Considering that the main request MRo' was filed at the latest with the letter dated 27 January 2021, i.e. after notification of the summons to oral proceedings, it is necessary to analyse whether there are exceptional circumstances which could speak in favour of its consideration by the Board.

1.1.2 The respondent argues that the alleged clerical error by the appellant in the set of claims (MRs) attached to the statement setting out the grounds of appeal is not plausible since the statement dealt with the request actually filed, i.e. MRs. Moreover, the summons was issued on 5 June 2020, whereas the correction of the alleged error took place only seven months later. This also speaks against the presence of such an error.

1.1.3 The Board agrees with the appellant that there is ambiguity over which main request was actually filed with the statement setting out the grounds of appeal.

As a matter of fact, in point 1 of the statement, the appellant declares that "*the **main request** as filed with letter of March 22, 2017 is maintained. The patentee further submits sets of claims according to Auxiliary*

Requests I to IV as enclosed". Hence, the request referred to in this passage is MRo. However, the requests enclosed with this document comprised a "Main Request" (MRs) which differed from MRo (see points XI and XII above).

The respondent is right that point 4 of the statement of grounds uses the wording "a work roll" and "the work roll" (as in MRs) when discussing features 1.1.1 and 1.1.2, but the Board considers that this only confirms the ambiguity in the first submissions. The main aim of point 4 was not to precisely quote the concerned features but rather to discuss their technical content. Therefore, the wording of point 4 cannot be conclusive on the real intention of the appellant. The discussion in this respect fully applies to the corresponding features of MRo.

As pointed out by the appellant, the respondent's submissions unambiguously concerned the main request underlying the impugned decision (MRo) (see the feature analysis in the reply to the statement of grounds, pages 3 and 4 - also filed as Annex A1 -).

In fact, both parties were made aware for the first time by the Board with its preliminary opinion dated 5 June 2020 of a possible discordance between the main request (MRo) underlying the impugned decision discussed by them in their submissions and the request (MRs) attached as the "main request" to the statement setting out the grounds of appeal. According to the Board's preliminary view, MRs was not admissible. The appellant reacted in removing the ambiguity by refiling the main request underlying the impugned decision (MRo'), which had been *de facto* already addressed and discussed by the parties.

1.1.4 The seven months lapse between the reception of the annex to the summons containing the preliminary opinion of the Board and the filing of the main request does not conclusively indicate the absence of an error in the filing of MRs with the statement of grounds. The preliminary opinion of the Board was the first occasion where the issue about which main request had actually been filed was raised. The Board finds it credible that there was a seven-month delay owing to the appellant having to analyse complex aspects involving legal liability for an error which might have resulted in the possible non-admittance of any request (see points 8, 9 and 11 of the Board's preliminary opinion) before a reply could be provided.

The filing of the main request MRo', corresponding to MRo, on 27 January 2021 was therefore a reaction on the first possible occasion in view of the exceptional circumstances to an issue raised by the Board for the first time.

1.1.5 The economy of the proceedings and fairness to the respondent must also be taken into account to decide on the admission of MRo'.

1.1.6 The Board agrees with the respondent that the reply to the statement of grounds cannot establish the requests of the appellant since this entirely lies within the responsibility of this party.

However, the reply of the respondent unambiguously addressed MRo (corresponding to the main request MRo'). This has not been contested by the respondent. The respondent thus studied the main request and raised all the points it considered relevant in a timely manner.

The admission of the late-filed main request MRo' would thus not imply the need for the respondent to raise any new arguments, facts or objections. This has been confirmed by the respondent during the oral proceedings.

The admission of MRo' would not change the arguments of the appellant either since the submissions of the statement of grounds are unambiguously applicable to MRo' as they addressed MRo.

The Board would thus not be faced with any new arguments, facts or objections from the parties when considering MRo' either.

1.1.7 Hence, the Board, having carefully studied the first submissions of both parties, which were directed to MRo, is also in an informed position concerning the technical content of MRo' and the discussions around the substantive matters in connection to it.

1.1.8 Finally, the main request was filed two and a half months before the oral proceedings. In view of the fact that the respondent and the Board were already familiar with all the arguments surrounding MRo, this is considered to be a reasonable time frame for enabling a proper discussion of the case.

1.1.9 The Board thus sees exceptional circumstances in the fact that an ambiguity has been removed which does not entail negative consequences neither for the respondent nor for the economy of the proceedings.

It successfully addresses the admissibility issue raised by the Board in connection with MRs without giving rise to new objections so far.

1.1.10 In view of the above, the Board exercises its discretion in accordance with Article 13(2) RPBA 2020 and admits the main request MRo' into the proceedings.

1.2 Interpretation of claim 1

1.2.1 Feature 1.1.1 (composite vs homogeneous work rolls)

The appellant argues that the work rolls must be understood as completely and integrally made of the material having a high modulus of longitudinal elasticity (feature 1.1.1), thus excluding a composite construction. According to the appellant, equations (1) and (2) of the patent **description** imply that the work roll is homogeneous in its longitudinal elasticity, and the skilled person would therefore have understood claim 1 as comprising this limitation.

The Board cannot agree with this interpretation of feature 1.1.1.

Feature 1.1.1 is clear and unambiguous in its wording, thus claim 1 does not need to be interpreted in light of the description. The feature "*the upper and lower work rolls use a material having a high modulus of elasticity*" thus encompasses work rolls comprising such a material at any location for any purpose and in any proportion to the total mass or volume of the work rolls. Work rolls produced in a composite manner are therefore encompassed by the scope of claim 1.

1.2.2 Feature 1.1.2 (feature of the stand vs the work rolls)

The appellant argues that the skilled person, when reading claim 1, would have understood that the minimum

roll diameter is a parameter of the control system of a rolling mill which is added to limit the number of times a work roll can be ground for maintenance. Feature 1.1.2 is thus a feature of the stand (i.e. the rolling mill) and not of the work rolls.

This argument is not persuasive.

Claim 1 does not claim any control system, any use of the minimum roll diameter as a parameter or any maintenance of the work roll, let alone in connection with the claimed minimum roll diameter.

Feature 1.1.2 merely defines that "*a minimum roll diameter of each of the upper and lower work rolls*" must be within a range defined by an upper and a lower limit. The expression "*minimum roll diameter*" has a clear and unambiguous meaning, namely that the work roll itself has a minimum diameter.

As the meaning of the feature is clear, the Board does not consider it necessary to resort to the description to interpret it. Furthermore, the description does not provide any reference to the alleged maintenance of the work roll or to the use of the minimum roll diameter as a parameter to be input into a control system of the rolling mill. The whole description merely discusses the horizontal bending of the work roll and discloses the calculation of the minimum diameter of a work roll made of a particular material to limit such horizontal bending. The description thus discloses an invention concerned only with the optimisation of the use of a material for a work roll and not any other aspect linked to the control of a rolling mill.

The Board agrees with the argument of the respondent concerning the fact that maintenance of the work rolls by grinding cannot be considered unavoidable for any rolling mill, to such an extent that the disclosure of a particular diameter in a document cannot be understood as a "minimum roll diameter" as suggested by the appellant. The skilled person would have had other options for ensuring the quality of the work roll, such as replacing the work rolls with identical ones when the quality of rolling decreases.

Consequently, the Board is of the opinion that any document disclosing work rolls of a diameter falling within the claimed range would unavoidably disclose feature 1.1.2.

1.2.3 "Rollable strip width" vs "strip width"

Feature 1.4 defines a "*rollable strip width of the work rolls*".

Feature 1.1.2 defines two parameters, D4max and D4min, which are described as the minimum diameter upper and lower limits "*of conventional work roll*[s] *with strip width of 1,300 mm*".

Feature 1.1.2 also defines a parameter B to be used in each of the claimed equations that is equal to "***the*** *strip width in mm/1,300 mm*" (emphasis added).

The appellant argues that the definite article "*the*" in the last case implies that "*the strip width*" must be understood as being equivalent to the "*rollable strip width*" of feature 1.4 and that this corresponds to the total usable length of the work rolls.

However, the Board considers that the definite article "the" relates to the feature "strip width" in the preceding line of claim 1 rather than to the feature "a rollable strip width" in feature 1.4 several lines above.

The Board agrees with the respondent that the reader of claim 1 might understand that "*rollable strip width*" and "*strip width*" are different entities in view of the different wording used such that the "*strip width*" corresponds to the width of the strip being rolled.

On the other hand, even if the "rollable strip width" were to be interpreted as the total usable length of the work rolls as argued by the appellant, claim 1 would not be limited to a specific width, i.e. to a specific length of the work rolls. Thus, any prior art disclosing a usable length of the work rolls resulting in feature 1.1.2 would anticipate this aspect of claim 1.

1.3 Novelty, D1 - Article 54(2) EPC

1.3.1 Document D1 (in light of its translation D1") discloses the following features of claim 1:

- A six-high rolling mill ("*pretreatment rolling mill*", see figure 1 and paragraph <0015> of D1", second sentence; feature 1)

- The six-high rolling mill including:

  - Upper and lower work rolls (2) as a pair for rolling a metal strip (1) (feature 1.1)

- Upper and lower intermediate rolls (13) as a pair for supporting the work rolls (2) (feature 1.2)
- Upper and lower back-up rolls (3) as a pair for supporting the paired upper and lower intermediate rolls (13) (feature 1.3)
- The six-high rolling mill having no supporting rolls inside and outside a rollable strip width of the work rolls (see figure 1; feature 1.4).

The appellant does not contest this.

1.3.2 Feature 1.1.1 (material of the work roll)

Contrary to the opinion of the appellant, feature 1.1.1 is disclosed in D1. This document discloses the use of a cemented carbide alloy in the work rolls of the six-high rolling mill (see last sentence of paragraph <0013> of D1"), and this material has a hardness between 42,000 and 63,000 kg/mm^2 according to the respondent. The decision of the opposition division states that the appellant acknowledged a hardness of 53,000 kg/mm^2 for the cemented carbide alloy, and the appellant has considered this value in the statement of grounds (see first paragraph of point 16.2 of the contested decision, second paragraph on page 5 of the submissions of the appellant dated 18 November 2015, and penultimate paragraph of page 10 of the statement setting out the grounds of appeal). In the absence of any statements to the contrary, the Board assumes that these hardness values are correct.

The ratios corresponding to these hardness values with respect to the conventional elasticity of 21,000 kg/mm^2 are:

42,000/21,000 = 2.0
53,000/21,000 = 2.5 (rounding off as in claim 1)
63,000/21,000 = 3.0

All values fall within the claimed range 1.2 to 3.0 of feature 1.1.1.

In view of the above and since the argument of the appellant against the composite construction of the work roll of D1 cannot succeed (see point 1.2.1 above), D1 discloses feature 1.1.1.

1.3.3 Feature 1.1.2

Paragraph <0011> of D1" discloses a diameter for the work roll of the six-high rolling mill ("for the pretreatment rolling") between 250 mm and 650 mm. Tables 3 and 6 of D1" disclose a diameter of 300 mm for the same work roll.

The respondent argues that the reference in paragraph <0013> of D1" to D2 means that D1 encompassed the disclosure of a strip width between 300 mm and 1500 mm in D2 ("*vertical length*"; see paragraph [0012] of D2). The reference to D2 in D1" was limited and precise, and the strip width of paragraph [0012] of D2 was therefore to be seen as incorporated by reference in the disclosure of D1".

The Board does not share this view.

Paragraph <0013> of D1 merely refers to the composite construction disclosed in D2 ("*an integrally formed composite roll which is made of cemented carbide alloy and consists of an axis part made of steel and a sleeve part forming its outer layer*") that can be used for the working rolls of the "*tandem rolling*" in D1. The last sentence of the same paragraph states that the work rolls of the "*pretreatment rolling*" (i.e. the six-high rolling mill) can be "*composite rolls of this kind, too*". As a result, the specific disclosure in D1 concerns the composite construction and does not refer to the rest of the features in D2, including the width of the work roll ("*vertical length*", in the wording of D2). Thus, it cannot be concluded that the width of the work roll disclosed in [0012] of D2 forms part of the disclosure of D1.

Since D1 is silent about the width of the work rolls of the six-high rolling mill, it cannot be considered that feature 1.1.2 is disclosed by this document. In the absence of a strip width disclosure in D1, it cannot be ascertained that the range of work roll diameters 250-650 mm or the specific value of 300 mm fall within the claimed range specified by Dmin1 and Dmax1 (see points 1.2.2 and 1.2.3 above).

Feature 1.1.2 is thus not disclosed by D1.

1.3.4 In view of the above, the subject-matter of claim 1 is novel with regard to D1.

1.4 Inventive step starting from D1 - Article 56 EPC

1.4.1 Admissibility of the lines of attack based on D1

The appellant requests that the lines of lack of inventive step attack based on combinations starting from D1 should not be admitted into the appeal proceedings since these objections have been raised for the first time during the oral proceedings before the Board. For the appellant, these lines of attack should have been filed with the reply to the statement of grounds of appeal.

The Board does not accept the appellant's view.

The new lines of lack of inventive step attack are based on D1 in combination with the common general knowledge or document D2 or D3. However, a thorough discussion on what the skilled person would have derived from the disclosure of D1, possibly in view of the disclosure of D2, already took place between the parties in their written and oral submissions when discussing the objection of lack of novelty over D1 (see point 1.3 above). Therefore, the new lines of lack of inventive step attack starting from D1 amount to a mere development of the respondent's case based on arguments already filed with the reply to the statement of grounds of appeal. In this respect, they cannot be held as a surprise to the appellant nor an amendment of the respondent's case within the meaning of Article 13(2) RPBA 2020.

Hence, these objections are not to be excluded from the proceedings.

Notwithstanding the above, the Board notes that lack of inventive step objections starting from D1 as the closest prior art in combination with, for instance, the skilled person's common general knowledge were dealt with in the impugned decision with respect to the

then auxiliary requests (see point 19). Hence, such attacks and related arguments are seen as forming part of the legal and factual framework of the appeal proceedings.

1.4.2 Remittal - Article 111 EPC and Article 11 RPBA 2020

The appellant requests that the case be remitted to the department of first instance for consideration of the new lines of lack of inventive step attack. The fact that the Board decided on novelty in a different way than the impugned decision did alone justify the remittal of the case to the department of first instance given that the new objections of lack of inventive step open new discussions with respect to, for example, the criteria for the selection of ranges. This would require a proper preparation.

The Board disagrees.

Firstly, the possibility that the Board takes a different view with regard to novelty from the impugned decision can never be excluded.

Secondly, the interpretation of feature 1.1.2 by the Board and the disclosure of D1 do not make necessary a discussion of the criteria for the selection of ranges (see point 1.2.2 above and point 1.4.7 below).

Thirdly, even the appellant foresaw at the beginning of the appeal proceedings that D1 could be considered the closest prior art for assessing inventive step, as apparent from point 5.2 of the statement setting out the grounds of appeal.

Finally, the Board agrees with the respondent that the remittal would entail a substantial delay in the proceedings which does not seem to be justified given that the parties and the Board are already familiar with the prior art and the points at stake.

As a result, the Board considers that there are presently no special reasons which would justify remitting the case to the opposition division (Article 111(1) EPC and Article 11 RPBA 2020).

1.4.3 D1 - closest prior art

Document D1 relates to the rolling of metal sheets (see paragraph <0001>) and like claim 1 discloses a six-high rolling mill (figure 1) for doing so. Consequently, contrary to the appellant's view, the Board considers that D1 is a suitable closest prior art for assessing the inventive step of the subject-matter of claim 1. The fact that the problem in D1 concerns the gloss of the rolled metal sheet and not the problem of the contested patent of reducing the deflection of the work rolls does not change this fact.

1.4.4 Strip width in D1

In view of the discussion on novelty under point 1.3 above, D1 does not disclose the strip width of the metal sheet or any rollable strip width of the work rolls. This represents the only distinguishing feature (feature 1.1.2).

1.4.5 Objective technical problem

The Board accepts the respondent's view that the technical effect associated with the distinguishing

feature is merely to put the disclosure of the six-high rolling mill of D1 into practice. The objective technical problem to be solved can therefore be seen as how to adapt the disclosure of D1 for its implementation. The skilled person, when trying to implement the invention of D1 with the work roll diameters of 250 mm (end value of the disclosed range in paragraph <0011>), would have had to define a strip width for the disclosed rolling mill.

1.4.6 Consideration of the strip width

The parties have confirmed that four feet (around 1219 mm) is a typical material dimension for the steel sheets to be processed by the rolling mills on the market. The patent specification itself discloses this dimension in the "conventional" prior art (see paragraph [0002]).

The skilled person starting from D1 would have had few standard steel sheet dimensions to choose from on the market when putting the disclosure of D1 into practice. Since four feet is a conventional measurement, the skilled person would immediately have thought of such a strip width in an obvious manner based on their common general knowledge. As admitted by the appellant at the oral proceedings, D1 relates to any width. Thus, there is no indication in D1 which would have prevented the skilled person from selecting this strip width.

1.4.7 Consequences of the obvious strip width on the distinguishing feature 1.1.2

When applying the conventional dimension of four feet to the formulae of feature 1.1.2 and taking the longitudinal elasticity of 53,000 kg/mm^2 into

consideration (see point 1.3.2 above), the minimum diameter upper and lower limits are:

$Dmax1 = 380*(1219/1300)/(2.5)^{(1/4)} = 284$ mm

$Dmin1 = 180*(1219/1300)/(2.5)^{(1/4)} = 134$ mm

At least the specific value of 250 mm (lower end of range: see D1", paragraph <0011>) disclosed in D1 falls within this range.

Even if the end values of the range of modulus of longitudinal elasticity proposed by the respondent were considered, the specifically disclosed diameters of D1 would still fall within the resulting ranges:

For a modulus of longitudinal elasticity equal to 42,000 kg/mm^2:

$Dmax1 = 380*(1219/1300)/(2)^{(1/4)} = 300$ mm

$Dmin1 = 180*(1219/1300)/(2)^{(1/4)} = 142$ mm

For a modulus of longitudinal elasticity equal to 63,000 kg/mm^2:

$Dmax1 = 380*(1219/1300)/(3)^{(1/4)} = 271$ mm

$Dmin1 = 180*(1219/1300)/(3)^{(1/4)} = 128$ mm

Since feature 1.1.2 is interpreted as a feature of the work rolls (see point 1.2.2 above), it follows that the only distinguishing feature 1.1.2 (see point 1.3 above) is achieved when implementing the six-high rolling mill of D1 in an obvious way according to the common general knowledge of the skilled person.

Consequently, the skilled person would have arrived at the claimed invention in an obvious manner when implementing the six-high rolling mill of D1.

1.4.8 Conclusion

The subject-matter of claim 1 of the main request does not involve an inventive step with regard to the combination of D1 with the common general knowledge of the skilled person.

2. Auxiliary requests Ib-IVb - Admissibility

2.1 Legal framework

The revised Rules of Procedure of the Boards of Appeal (RPBA 2020) entered into force on 1 January 2020. Subject to the transitional provisions (Article 25(1) RPBA 2020), the revised version also applies to appeals pending on the date of the entry into force, as in this case.

Since auxiliary requests Ib-IVb were filed at a later stage, namely after the notification of the summons to oral proceedings in 2020, Article 13(2) RPBA 2020 applies for assessing their admission into the proceedings (Article 25(3) RPBA 2020).

2.2 Discussion

2.2.1 The appellant argues that the same logic as for the main request should apply to the consideration of admissibility of auxiliary requests Ib-IVb. They correspond in substance to auxiliary requests I to IV,

which were filed with the statement setting out the grounds.

The Board does not share this view. The circumstances for auxiliary requests Ib-IVb are different for the main request MRo' (see point 1.1 above).

As a matter of fact, the subject-matter of the sets of claims according to auxiliary requests Ib-IVb are based on that of auxiliary requests I-IV, which were filed for the first time with the statement setting out the grounds. However, even these latter requests were not presented during the opposition proceedings although they could and even should have been presented then (see point 4 below).

Given the new subject-matter, admitting auxiliary requests Ib-IVb would entail the opening of new issues for discussion for the first time in the appeal proceedings. This would run against the economy of the proceedings (see points XIII to XVI and XXI to XXIV above).

2.2.2 The appellant further argues that the reasons of the opposition division for considering that D1 disclosed the claimed material of the work rolls could only be known when receiving the contested decision. Auxiliary requests Ib to IVb, on the basis of auxiliary request I to IV, should be seen as a legitimate reaction to such an erroneous conclusion.

This argument is not persuasive.

The conclusions of the opposition division could not come as a surprise for the appellant since the notice of opposition contained the same novelty objection

based on D1 (see point IV of the notice of opposition), as did the communication annexed to the summons for oral proceedings sent by the opposition division, dated 16 September 2016, point 7.

2.2.3 The appellant points out that a change of representative took place after the opposition proceedings and that the auxiliary requests of the appeal proceedings were filed by the current representative.

The Board cannot accept this as a justification for the late filing of auxiliary requests Ib-IVb since the obligations contained in the Rules of Procedure of the Boards of Appeal are for the parties, irrespective of their choices concerning representation.

2.3 Conclusion

In view of the above, no exceptional circumstances can be observed which could justify the late filing of auxiliary requests Ib-IVb.

Auxiliary requests Ib, IIb, IIIb and IVb are therefore not admitted into the proceedings (Article 13(2) RPBA 2020).

3. Auxiliary requests Ia-IVa - Admissibility

Since auxiliary request Ia-IVa were filed together with auxiliary requests Ib-IVb, namely after the notification of the summons to oral proceedings in 2020, the provisions in Article 13(2) RPBA 2020 also apply for their admission.

Auxiliary requests Ia-IVa correspond in substance to auxiliary requests Ib-IVb, in which some editorial changes have been carried out in the characterising portion, but the claimed subject-matter remains basically the same (see points XVII to XX above).

Since the circumstances correspond to those previously discussed concerning auxiliary requests Ib-IVb (see point 2.2 above), the same considerations apply.

Auxiliary requests Ia, IIa, IIIa and IVa are therefore not admitted into the proceedings for the same reasons (Article 13(2) RPBA 2020).

4. Auxiliary requests I-IV - Admissibility

4.1 Legal framework

The transitional provisions of Article 25(2) RPBA 2020 foresee the application of Article 12(4) RPBA 2007 to the statement of grounds of appeal when this was filed in due time before 1 January 2020, as in the current case.

Since auxiliary requests I-IV were filed with the statement of grounds of appeal, Article 12(4) RPBA 2007 must be taken into account when deciding on their admissibility.

4.2 Discussion

Auxiliary requests I-IV were filed for the first time during the appeal proceedings. Their subject-matter changes in substance with respect to those of the sets of claims which had been filed and considered in the

opposition proceedings and dealt with in the impugned decision. This has not been contested by the appellant.

The Board considers that these requests could and should have been filed during the first-instance proceedings.

The reasons provided by the appellant for having not done so are the same as those for auxiliary requests Ib-IVb. Hence, for the same reasons as those given under point 2.2 above, the Board does not accept the appellant's view.

4.3 Conclusion

The auxiliary requests I, II, III and IV are not admitted into the proceedings (Article 12(4) RPBA 2007).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Spira G. Patton

Decision electronically authenticated