BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File No.: T 0574/90 - 3.2.5

Application No.: 83 402 403.6

Publication No.: 0 144 480

Classification: B21B 21/00

Title of invention: Cold pilger mill

D E C I S I O N
of 13 October 1993

Applicant: -

Proprietor of the patent: Sumitomo Metal Industries, Ltd.

Opponent: Mannesmann Aktiengesellschaft

Headword: -

EPC: Art. 56

Keyword: "Inventive step (no)"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

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Case Number: T 0574/90 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 13 October 1993

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 16 May 1990 revoking European patent No. 0 144 480 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: C.V. Payraudeau
Members: A. Burkhart
H.J. Seidenschwarz

Summary of Facts and Submissions

I. The Appellant (Proprietor of the patent) lodged an appeal against the decision of the Opposition Division to revoke the patent No. 0 144 480.

The Opposition Division had expressed the view that the grounds for opposition mentioned in Article 100(a) EPC prejudiced the maintenance of the patent, since the subject-matter of Claim 1 of the patent did not involve an inventive step having regard to document D1: "Stahlrohrherstellung", VEB Deutscher Verlag für Grundstoffindustrie, Leipzig 1970, pages 257-259.

II. With the communication of 19 March 1993 pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal the Board communicated that it considers document D2 (DE-A-1 939 914) as representing the closest prior art and that it would be necessary during the oral proceedings to examine whether the subject-matter of the claims involved an inventive step in view of the documents D1, D2 and D3 (US-A-4 037 444).

The Board communicated also that it did not see a substantial procedural violation by the Opposition Division which would justify a reimbursement of the appeal fees as had been requested by the Appellant in his Statement of Grounds.

III. With his letter of 10 September 1993 the Appellant requested that the decision under appeal be set aside and the patent maintained on the basis of the following documents:

Main request:
Claims: 1 to 5, received on 10 September 1993;

Description: pages 8 and 9, received on 10 September 1993,
pages 1 to 7 and 10 to 29, as originally filed;

Drawings: Figures 1 to 7, as originally filed.

First auxiliary request:
Claims: 1 to 3, received on 10 September 1993;

Description: pages 8 and 9, received on 10 September 1993,
pages 1 to 7 and 10 to 29, as originally filed;

Drawings: Figures 1 to 7, as originally filed.

Second auxiliary request:
Claims: 1 to 3, received on 10 September 1993;

Description: pages 8 and 9, received on 10 September 1993,
pages 1 to 7 and 10 to 29, as originally filed;

Drawings: Figures 1 to 7, as originally filed.

IV. Claim 1 according to the main request reads as follows:

"1. A cold pilger mill comprising:
- a rolling mechanism (20, 22, 24, 26) for intermittently rolling a tubular material over a mandrel to produce a reduced diameter pipe, said rolling mechanism including a pair of grooved rolls (26)

rotatably supported by a pair of saddles (24), said grooved rolls being arranged to embrace said tubular material from opposite sides thereof, said saddles being reciprocated to define a material rolling stroke by a crank shaft (22) rotated by a first motor (20), each of said grooved rolls having fixed thereto a pinion (28a) in mesh with a stationary rack (28b) for rotation with the respective roll,

- a feeding mechanism (40, 42) for feeding said tubular material in an axial direction, and

- a turning mechanism comprising

. a mandrel chuck (64) for grasping a tail end of said mandrel,

. an entry turning chuck (68) located near an entry side of said saddles (24) in the rolling direction of said saddles, for holding said tubular material over said mandrel, and

. an exit turning chuck (70) located adjacent a side of said saddles opposite said entry turning chuck (68) in the rolling direction of said saddles, for holding said tubular material over said mandrel, the feeding mechanism and the turning mechanism being separately driven by individual motors independent of the first motor, said feeding mechanism being driven by a second motor (76, 76a), said mandrel chuck being driven by a third motor (78, 78a), said entry turning chuck being driven by a fourth motor (80, 80a) and said exit turning chuck being driven by a fifth motor (82, 82a), the cold pilger mill also comprising:

- a detector (74) communicating with said rolling mechanism for detecting the rolling phase in said rolling mechanism, and

- an electrical main controller (72) for synchronizing operations of the feeding mechanism and the turning mechanism with operation of the rolling mechanism without use of mechanical coupling means, said electrical main controller (72) receiving signal input

from said detector (74) and supplying an operation signal to the respective motors (76, 78, 80, 82; 76a, 78a, 80a, 82a) of said feeding mechanism, said mandrel chuck (64), said entry turning chuck (68) and said exit turning chuck (70) so that said feeding mechanism and said chucks are operated upon completion of each rolling stroke."

Claim 1 according to the first auxiliary request differs from Claim 1 according to the main request in that the following features are added:

"each of said second, third, fourth and fifth motors (76, 78, 80, 82) being a pulse motor, and said main controller (72) providing predetermined numbers of power pulses to said pulse motors upon completion of each rolling stroke in response to signal input from said detector (74), and said main controller (72) including a pulse generator (90) and preset counters (94a, 94b) for counting the number of pulses to be supplied to each of said pulse motors, said main controller providing power pulses until the respective counters reach predetermined count values."

Independent Claim 2 according to the first auxiliary request differs from Claim 1 according to the main request in that the following features are added:

"each of said second, third, fourth and fifth motors (76a, 78a, 80a, 82a) communicating with a rotational angle detector (76b, 78b, 80b, 82b) and a local controller (76c, 78c, 80c, 82c) and said main controller (72) providing an operation signal to each local controller upon completion of each rolling stroke in response to signal input from said rolling phase detector, each of said local controllers being operative to place the motor associated therewith in an operating

condition responsive to said operation signal from said main controller and to monitor output from the associated rotational angle detector so as to stop said associated motor when the associated motor rotates a predetermined amount."

Claim 1 according to the second auxiliary request is identical with Claim 1 according to the first auxiliary request.

Independent Claim 2 according to the second auxiliary request differs from Claim 2 according to the first auxiliary request in that the second, third, fourth and fifth motors are identified as "being a servo motor".

V. The Appellant essentially argued as follows:

The teaching of document D1 could not render obvious the cold pilger mill according to Claim 1 of the main request, since it described a cold pilger mill so vaguely that it only gave a very simple and general idea which was very far from the invention. Moreover, in the pilger mill according to document D1 the mandrel and the pipe were always rotated simultaneously at a given rate by two hydraulic motors which rate was determined by a cam disc controlling the two motors. Therefore the turning of the mandrel and tubular material could not be controlled independently from each other, contrary to the present invention which made it possible to separately control the rotation of the mandrel and the rotation of the tubular material. From this it followed that the replacement of the cam disc 4 by an electrical controller would not result in the pilger mill according to Claim 1.

None of the citations D1, D2 and D3 disclosed the essential feature of the invention, namely that each of the grasping mandrel chuck, entry turning chuck and exit turning chuck is driven by an individual motor, these individual motors being each controlled by the electrical main controller, which feature was very advantageous because it simplified the construction of the cold pilger mill.

The cold pilger mills according to the first and second auxiliary requests were not rendered obvious by document D2, since this document was directed to the use of hydraulic motors and since in this document there was no mention of a rolling pulse detector.

VI. Oral proceedings were held on 13 October 1993.

The duly summoned Appellant did not appear, having notified the Board by telefax on 15 September 1993 that he would not attend the oral proceedings. The oral proceedings were therefore continued without him (Rule 71(2)EPC).

The Respondent (Opponent) essentially argued as follows:

The subject-matter of Claim 1 according to the main request did not involve an inventive step, since the person skilled in the art was incited by document D2 to replace in the conventional cold pilger mill depicted in Figure 2 of the granted patent the mechanical power transmission mechanism by a control system comprising separate, individually driven motors for each of the feeding mechanism and turning mechanisms and an electrical main controller for synchronising the operations of these individual motors in response to signals received from a detector for detecting the rolling phase in the rolling mechanism. The subject-

matter according to the first and second auxiliary requests did also not involve an inventive step with respect to the teachings of documents D2 and D3, the latter document suggesting the use of electrical servomotors in a cold pilger mill control system.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. *Inventive step of the subject-matter of Claim 1 according to the main request*

1.1 Figure 2 of the granted patent shows a well-known conventional cold pilger mill (see also column 1, line 10 and column 3, line 26 of the granted patent), which is described in column 1, line 9 to column 3, line 53 of the patent specification as comprising

- a rolling mechanism for intermittently rolling a tubular material over a mandrel to produce a reduced diameter pipe, said rolling mechanism including a pair of grooved rolls rotatably supported by a pair of saddles, said grooved rolls being arranged to embrace said tubular material from opposite sides thereof, said saddles being reciprocated to define a material rolling stroke by a crank shaft rotated by a motor, each of said grooved rolls having fixed thereto a pinion in mesh with a stationary rack for rotation with the respective roll,

- a feeding mechanism for feeding said tubular material in an axial direction, and

- a turning mechanism comprising

  a mandrel chuck for grasping a tail end of said mandrel,
  an entry turning chuck located near an entry side of said saddles in the rolling direction of said saddles, for holding said tubular material over said mandrel, and
  an exit turning chuck located adjacent a side of said saddles opposite said entry turning chuck in the rolling direction of said saddles, for holding said tubular material over said mandrel.

In this prior art cold pilger mill, a mechanical power transmission mechanism consisting of gears, cams and shafts controls and operates the feeding mechanism and the chucks of the turning mechanisms in synchronism with the strokes of the crank shaft of the rolling mechanism.

1.2 This conventional pilger mill presents the drawback that the mechanical power transmission mechanism is complicated with long shafts and that changes in the dimensions of the product and in operation mode are troublesome (see column 3, lines 35 to 53 of the granted patent).

Therefore, the problem underlying the invention consists in providing a cold pilger mill which has a very simple power transmission mechanism and which can easily comply with changes in the dimensions of the product and changes in operation mode (see column 3, lines 56 to 62 of the granted patent).

1.3 This problem is solved according to Claim 1 of the main request in that in the conventional cold pilger mill according to Figure 2 of the granted patent the mechanical power transmission mechanism is replaced by a control system comprising

- individually driven motors, independent of the motor for the rolling mechanism, for each of the feeding mechanism, the mandrel chuck, the entry turning chuck and the exit turning chuck,

- a detector communicating with the rolling mechanism for detecting the rolling phase in the rolling mechanism, and

- an electrical main controller for synchronising operations of the feeding mechanism and the turning mechanism with operation of the rolling mechanism without use of mechanical coupling means, said electrical main controller receiving signal input from said detector and supplying an operation signal to the respective motors of said feeding mechanism, said mandrel chuck, said entry turning chuck and said exit turning chuck so that said feeding mechanism and said chucks are operated upon completion of each rolling stroke.

1.4 This solution of the problem underlying the invention is obvious in the light of the teaching of document D2, for the following reasons:

Document D2 teaches that the mechanical power transmission mechanism for the operation of the feeding mechanism and the turning mechanisms of conventional cold pilger mills has certain disadvantages in respect of construction and operation and should therefore be

replaced by a system comprising individual motors for the operation of the feeding mechanism and the turning mechanism (see page 1 of the description, second and third paragraphs).

In line with this teaching, document D2 proposes a cold pilger mill (cf. Figure 1) comprising a rolling mechanism for intermittently rolling a tubular material over a mandrel to produce a reduced diameter tube, a feeding mechanism for feeding the tubular material, and a turning mechanism comprising a mandrel chuck for grasping and turning the tubular material, wherein the feeding mechanism and the turning mechanism are separately driven by individual motors (5, 7) independent of the motor of the rolling mechanism (not shown).

This known cold pilger mill comprises also a detector (24) communicating with the rolling mechanism for detecting the rolling phase in the rolling mechanism, and an electrical main controller (22) for synchronising operations of the feeding mechanism and the turning mechanism with operation of the rolling mechanism without use of mechanical coupling means, the electrical main controller (22) receiving signal input from the detector (24) and supplying an operation signal to the respective motors (5, 7) of the feeding mechanism and the mandrel and tube turning mechanism, so that the feeding mechanism and the turning mechanism are operated upon completion of each rolling stroke (see also pages 5 and 6 of document D2).

In document D2 it is mentioned that the provision of the electrical main controller for controlling the operation of the individual motors 5 and 7 allows for variations of the turning angle and the advance of the tubular

material within a wide range and that therefore the cold pilger mill can easily comply with changes in operation mode (see page 8, lines 12 to 18).

Therefore, the person skilled in the art derives from document D2 the teaching that the problem underlying the invention with respect to the prior art according to Figure 2 of the granted patent can be solved by replacing a substantial portion of the mechanical power transmission mechanism connecting the rolling mechanism with the feeding mechanism and the turning mechanisms by a system comprising individual motors for each of the feed mechanism, mandrel chuck, entry turning chuck and exit turning chuck, and an electrical main controller for synchronising the operations of the feeding mechanism and the turning mechanisms with the operation of the rolling mechanism in response to signals obtained by a detector for detecting the rolling phase of the rolling mechanism.

1.5 As to the contention of the Appellant in his Statement of Grounds that the provision of separate motors for each of the mandrel turning chuck, entry turning chuck and exit turning chuck offers the possibility of relative rotation between the mandrel and the tubular material so that local wearing and welding between the mandrel and the tubular material can be prevented, which possibility was not mentioned in document D2, the following has to be stated:

Firstly, this "possibility" is neither claimed in the patent nor disclosed in the patent as granted or in the originally filed application documents. On the contrary, from the description of the granted patent (see column 7, lines 19 to 22 and 53 and 54) can be derived that the mandrel and the tubular material are turned together without relative rotation.

Secondly, this "possibility" is obtained automatically as an indirect result, if the person skilled in the art, following the general teaching of document D2, replaces each of the gear drives of the mandrel turning chuck, entry turning chuck and exit turning chuck in the prior art device according to Figure 2 of the granted patent by an individual motor.

Therefore, an inventive step cannot be based on this "possibility".

1.6 For these reasons, the cold pilger mill according to Claim 1 of the main request does not involve an inventive step in the meaning of Article 56 EPC and consequently, this claim is not allowable.

2. Claims 2 to 5 of the main request fall because of their dependency on Claim 1.

3. *Inventive step of the subject-matter of Claim 1 according to the first auxiliary request*

The cold pilger mill according to Claim 1 of the first auxiliary request constitutes a special embodiment of said mill according to Claim 1 of the main request, wherein each of the second, third, fourth and fifth motors is a pulse motor, and the main controller provides predetermined numbers of power pulses to said pulse motors upon completion of each rolling stroke in response to signal input from the detector, and the main controller includes a pulse generator and preset counters for counting the number of pulses to be supplied to each of the pulse motors, the main controller providing power pulses until the respective counters reach predetermined count values.

This special embodiment does not involve an inventive step for the following reasons:

Document D3 suggests the use of an electrical servomotor in an electrically controlled feeding mechanism of a cold pilger mill (see Figures 1 and 2 and corresponding description of document D3).

The person skilled in the art would therefore regard it as a normal design option to take into consideration the use of such servomotors as an obvious alternative to the use of hydraulic motors described in document D2.

The person skilled in the art would also regard it as a normal design option to select pulse motors (stepping motors) as servo motors, since pulse motors are commonly used as drive means in control systems of automatic machines. The use of pulse motors in a control system, of course, necessitates the provision of appropriate control means, like pulse generators and pulse counters for activating the pulse motors, as is indicated in the last paragraph of Claim 1 according to the first auxiliary request.

Therefore, the person skilled in the art, having in mind the teachings of documents D2 and D3, would arrive, without the exercise of inventive skill, at the subject-matter of Claim 1 of the first auxiliary request.

Consequently, Claim 1 according to the first auxiliary request is also not allowable with respect to Article 56 EPC.

4. *Inventive step of the subject-matter of Claim 2 according to the first auxiliary request*

The pilger mill according to Claim 2 of the first auxiliary request constitutes a special embodiment of the pilger mill according to Claim 1 of the main request, wherein each of the second, third, fourth and fifth motors communicates with a rotational angle detector and a local controller and the main controller provides an operation signal to each local controller upon completion of each rolling stroke in response to signal input from the rolling phase detector, each of the local controllers is operative to place the motor associated therewith in an operating condition responsive to the operation signal from the main controller and to monitor output from the associated rotational angle detector so as to stop the associated motor when the associated motor rotates a predetermined amount.

This special embodiment does not involve an inventive step for the following reasons:

Since document D3 suggests for the drive means of the feeding mechanism the use of a servomotor 41 in combination with a "resolver" 43 (local controller) which acts as a feedback system to ensure that the servomotor operates correctly (see column 3, lines 12 to 18), it is obvious for the person skilled in the art to use also in the cold pilger mill according to Claim 1 of the main request for the same purpose a similar system comprising a local controller for each of the second, third, fourth and fifth motors, comprising a rotation angle detector as a sensing means.

Consequently, Claim 2 according to the first auxiliary request is also not allowable with respect to Article 56 EPC.

5. Claim 3 of the first auxiliary request falls because of its dependency on Claims 1 and 2.

6. *Inventive step of the subject-matter of Claim 1 according to the second auxiliary request*

Claim 1 of the second auxiliary request is identical with Claim 1 of the first auxiliary request, and is therefore, for the same reasons as the latter, not allowable.

7. *Inventive step of the subject-matter of Claim 2 according to the second auxiliary request*

Claim 2 of the second auxiliary request differs from Claim 2 of the first auxiliary request only in that the individual motors are defined as being servomotors.

Since the argumentation regarding lack of inventive step with respect to Claim 2 according to the first auxiliary request is already based on the fact that the use of a servomotor is known from document D3, this argumentation is likewise valid also for the subject-matter of Claim 2 of the second auxiliary request.

Consequently, Claim 2 according to the second auxiliary request is also not allowable with respect to Article 56 EPC.

8. Claim 3 of the second auxiliary request falls because of its dependency on Claims 1 and 2.

9. Since the appeal is dismissed, a reimbursement of the appeal fees, as requested by the Appellant, is not possible.

Order

For these reasons, it is decided that:

1. The appeal is dismissed.

2. The request for reimbursement of the appeal fees is rejected.

The Registrar: The Chairman:

A. Townend C. Payraudeau