BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 1 October 1998

Case Number: T 0900/96 - 3.4.2

Application Number: 88904027.5

Publication Number: 0309563

IPC: H05B 6/10

Language of the proceedings: EN

Title of invention:
Electric induction heat treating furnace

Patentee:
National Steel Corporation, et al

Opponents:
Stein Heurtey, Société anonyme francaise
Celes

Headword:
-

Relevant legal provisions:
EPC Art. 123(3), (2), 54, 56

Keyword:
"Main request: protection extended (no); additional subject-matter (no); novelty (yes); inventive step (yes)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0900/96 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 1 October 1998

Appellant: (Opponent)
Stein Heurtey, Société anonyme francaise
Z.A.I. du bois de l'Epine
91130 Ris Orangis (FR)

Representative:
Armengaud Ainé, Alain
Cabinet Armengaud Aine
3 Avenue Bugeaud
75116 Paris (FR)

Other party: (Opponent)
Celes B.P.5
68610 Lautenbach (FR)

Representative:
Armengaud Ainé, Alain
Cabinet Armengaud Aine
3 Avenue Bugeaud
75116 Paris (FR)

Respondent: (Proprietor of the patent)
National Steel Corporation
National Steel Center
20 Stanwix Street
Pittsburg, Pennsylvania 15222 (US)

Ajax Magnethermic Corporation
1745 Overland Avenue, N.E.
Post Office Box 991
Warren, OH 44482 (US)

Representative:
Altenburg, Udo, Dipl.-Phys.
Patent- und Rechtsanwälte
Bardehle . Pagenberg . Dost . Altenburg .
Frohwitter . Geissler & Partner
Postfach 86 06 20
81633 München (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 16 September 1996 rejecting the opposition filed against European patent No. 0 309 563 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: M. Chomentowski
B. J. Schachenmann

Summary of Facts and Submissions

I. The respondents are proprietors of European patent No. 0 309 563, which was granted with 14 claims on the basis of European patent application No. 88 904 027.5 which, with respect to the technique known as "galvannealing" for the production of coated steel products, cited inter alia D6 = US-A-2 986 808 for electric induction furnaces and also acknowledged gas fired furnaces. The two only independent claims as granted read as follows:

"1. An electric induction furnace (32) for use in a continuous galvanneal operation wherein a zinc coating applied to the surface of a running length of steel (10) is converted to a zinc iron alloy coating by passing the running length of zinc coated steel along a generally straight path through the furnace (32) and heating the coated strip during movement through the furnace to alloy the zinc coating with iron from the steel strip, said furnace (32) having at least one induction coil (34, 36, 38, 40, 42, 44) including electric conductor means (188) defining a closed loop (184) having an opening (186) through which the running length of coated steel passes in movement through the furnace, and power means (66, 68, 70) supplying electric current to the conductor means (188) for inductively heating the coated strip passing through the closed loop (184),

characterized by,

a frame (78) supporting said at least one induction coil (34, 36, 38, 40, 42, 44),
carriage means (58) supporting said frame (78) and said coil being movable between a first position wherein the opening (186) in said coil extends around said

generally straight path and a second position wherein the coil is spaced from said generally straight path, connector means (208) defining a part of said conductor means (188),
door means (170) mounting said connector means (208) being movable between a closed position forming part of said loop (184), and an open position forming an opening in the said loop (184) and
power means (178) operatively associated with said door means (170) for moving said connector means (208) between said open and said closed positions whereby said closed loop (184) may be opened to permit said furnace (32) to be moved between said first and said second positions while said running length of zinc coated steel (10) extends along said straight path."

"14. A continuous galvanneal method wherein a zinc coating applied to the surface of a running length of steel (10) is converted to a zinc iron alloy coating by passing the running length of zinc coated steel along a generally straight path through a furnace (32) and heating the coated strip during movement through the furnace to alloy the zinc coating with iron from the steel strip, said furnace (32) having at least one induction coil (34, 36, 38, 40, 42, 44) including electric conductor means (188) defining a closed loop (184) having an opening (186) through which the running length of coated steel passes in movement through the furnace, and power means (66, 68, 70) supplying electric current to the conductor means (188) for inductively heating the coated strip passing through the closed loop (184),

characterized by

opening the at least one induction coil when the coil is not energized to enable the furnace to be moved transversely of the strip to a non-use position while the strip remains in position."

II. The two appellants (opponents) filed an opposition against the grant of the patent, on the grounds that its subject-matter was not new or lacked an inventive step having regard to, inter alia, D6 and D2 = M. G. Lozinskii, Industrial Applications of Induction Heating, Pergamon Press, First English edition 1969, pages v to vi, 87 to 92 and 478 to 480.

III. The oppositions were rejected.

The opposition division agreed to the following arguments presented by the patent proprietors:

The preamble of each of the claims 1 and 14 was known from D6, which was the only document showing a coil of an electric induction furnace completely enclosing the continuously moving strip for creating a longitudinal magnetic flux in the direction of the moving strip and inductively heating the strip previously coated with zinc to alloy it with the strip material, and represented thus the closest prior art in galvannealing technique. A drawback of this old known technique (1961), which was recognized since a long time, was that the continuously moving strip could not be removed for maintenance and/or replacement purposes from the surrounding coil without cutting said strip; it was an object of the present invention to provide an induction coil with door means allowing displacement of the coil with respect to the strip without cutting said strip inside. Split inductors were already known in the art for many years, they were however utilized only for treating stationary workpieces, and not fast moving strips.

Therefore, the claimed technique, which represented a breakthrough and replaced with great commercial success in particular the known gas flame galvannealing techniques used in practice, involved an inventive step.

IV. The opponents (appellants) lodged an appeal against this decision.

V. During the oral proceedings of 1 October 1998 which had been requested auxiliarily by the parties, the respondents (patent proprietors) requested as a main request that the patent be maintained in amended form, with the following feature being added at the end of claim 14:

"using a furnace (32) as defined in one of claims 1 to 13".

VI. The appellants requested that the decision under appeal be set aside and that the patent be revoked, and argued in substance as follows in support of their requests:

New documents, D11 = FR-A-2 563 537 and D13 = files relating to prior uses based on Stein Heurtey appliances, have been cited in the statement of grounds of appeal for stressing what was the state of the art at the oldest priority date of the patent in suit. It was known from D13 to provide U-shaped gas flame galvannealing furnaces with a door for closing and/or opening said open end of the U-shaped furnace, this allowing the furnace to be moved laterally without cutting the running strip. The person skilled in the art of D13 also knew that there were other types of galvanneal furnaces, for instance electric induction furnaces with closed coils surrounding a running strip to be treated, known from D11, wherein the coil cannot be moved from the running strip without cutting said

strip. Thus, it was obvious for the skilled person to transpose the solution adopted in D13, i.e. the door means closing and/or opening the gas furnace, to the electric galvanneal furnace of D11 and provide for this purpose the coil with openable door means, as this is generally known, for instance on the basis of D2, with respect to split inductors.

Obviously, the claimed technique was introduced as an answer to new needs of the car manufacturing industry and at a time when new electric sources adapted to this technique came on the market. In view of this situation, commercial success is not sufficient for establishing that an inventive step was involved in the subject-matter of the present claims.

It was also to be noted that at least one of the objects mentioned in the patent in suit and concerning means for accurately positioning the coils relative to the running strip is not solved by the independent claims of the patent in suit, but only by features contained in dependent claims, so that there is also lack of inventive step in this respect.

VII. The respondents submitted in substance the following arguments in support of their requests:

Electric inductors galvanneal furnaces wherein the strip to be treated is surrounded by a closed loop and thus must be cut when it is to be taken out of the furnace, are known from D6 (or D11), i.e. since 1961. Split inductors such as those known from D2 belong to another technical field and are known at least since 1969. Thus, it is only with the benefit of hindsight that it could be considered that the skilled person, at the priority dates of the patent in suit, i.e. 1987, i.e. several years after about 1980, when the gas fired galvanneal furnace technique with door means of D13

became known, could have found it obvious to adapt the electric induction coil furnace means of D6 or D11 to obtain the same advantages as those provided by the openable gas furnace of D13 and have taken into account for this purpose door means of the type otherwise known for instance from D2, an old document belonging to a different technical field of inductor heating devices.

There is a plurality of secondary indications that an inventive step was involved, related with the undisputed fact that during a long time period electric inductor galvanneal techniques were not carried out in practice, whereas, following the invention in dispute, said electric induction galvanneal furnaces replaced in terms of sale the gas fired ones and became a great commercial success for the proprietors who, in any case, were the first ones to develop and patent this invention.

Concerning the objection that one of the objects mentioned in the patent in suit was not specifically solved by the features of the independent claims, but by features of dependent claims, this was not to be considered as resulting in lack of inventive step since at least one of the mentioned main objects of allowing the furnace to be displaced from the running strip was indeed solved by the main claims.

Therefore, the subject-matter of the claims involves an inventive step.

Reasons for the Decision

1. The appeals are admissible.

2. *Formal requirements*

The only amendment consisting in the addition of the expression "using a furnace (32) as defined in one of claims 1 to 13" at the end of method claim 14 as granted, there can be seen neither inadmissible extension in protection or in subject-matter, nor any resulting lack of clarity, and the appellants have not made any objection to this effect either (Article 123(3), 123 (2) and 84 EPC).

3. Novelty

3.1 An electric induction furnace is known from D11 (see the whole document, and in particular the text locations related to Figure 3); this furnace is for use in a continuous galvanneal operation wherein a zinc coating applied to the surface of a running length of steel (12) is converted to a zinc iron alloy coating by passing the running length of zinc coated steel along a generally straight path through the furnace and heating the coated strip during movement through the furnace to alloy the zinc coating with iron from the steel strip, said furnace having at least one induction coil (24) including electric conductor means defining a closed loop having an opening through which the running length of coated steel passes in movement through the furnace, and power means (S, 36, 38, 34) supplying electric current to the conductor means for inductively heating the coated strip passing through the closed loop, along the axis of said coated strip ("dans son axe").

However, contrary to the furnace in dispute, in the electric induction furnace of D11, there is

no frame supporting said at least one induction coil, with carriage means supporting said frame and said coil being movable between a first position wherein the opening in said coil extends around said generally straight path and a second position wherein the coil is spaced from said generally straight path,

no connector means defining a part of said conductor means,

no door means mounting said connector means being movable between a closed position forming part of said loop, and an open position forming an opening in the said loop and

no power means operatively associated with said door means for moving said connector means between said open and said closed positions whereby said closed loop may be opened to permit said furnace to be moved between said first and said second positions while said running length of zinc coated steel extends along said straight path.

3.2 The induction electric furnace of D6 (see in particular Figure 2 and the corresponding text) is of the same type as that of D11, is however somewhat less relevant in the sense that the coil is structurally not completely closed and thus could define a loop which is not completely closed.

The electric induction heating device known from D2 (see in particular Figure 54 and the corresponding text on pages 89 and 90) is not a furnace and does not comprise features directed to the use in a continuous galvanneal operation.

The public availability of the teaching of D13 has not been contested by the respondents; it concerns indeed a furnace for the use in a continuous galvanneal operation, whereby however the furnace is not an electric induction furnace, but a gas furnace.

The other prior art documents are less relevant.

3.3 Therefore, the subject-matter of claim 1 in dispute is not part of the state of the art and is thus new in the sense of Article 54 EPC.

4. *Inventive step*

4.1 The electric induction furnace of D11 comprises all the features recited in the preamble of claim 1 in dispute and can thus be considered as an adequate starting point for the present invention. This known furnace credibly has the same drawback as that mentioned in the patent in suit (see column 3, lines 36 to 48, in particular 40 to 48) having regard to the in many respects similar furnace of D6. In the furnace of D11, because of the induction coils completely surrounding the running length of coated steel being heat treated during operation, the strip would necessarily have to be cut in order to move the furnace from the position above the zinc pot wherein the zinc is provided on the steel strip, making it necessary to rethread the system. An object of the present invention is mentioned in the patent in suit (see column 4, lines 24 to 31; see also column 3, lines 36 to 53, in particular 40 to 53) as being to provide an improved galvanneal furnace in which, during operation, induction coils completely surround the running length of coated steel being heat treated and which includes means for opening the induction coils when the coils are not energized to enable the furnace to be moved transversely of the

strip to a non-use position while the strip remains in position; in this respect, it is to be noted that gas fired furnaces constructed for transversal movement are also acknowledged in the same passage.

In the attainment of, inter alia, this object of the present invention, the at least one coil is provided with movable connector door means, said movable door means carrying segments of the electrical conductor material which may be moved to a closed operating position completing the loop to provide an electrical circuit throughout the coil and to an open position interrupting the electrical circuit and providing an opening in one end of the coil whereby the furnace may be moved laterally to pass the running length of the strip through the coil opening to enable the furnace to be removed from the line.

4.1.1 Indeed, as credibly argued by the appellants, a similar problem had been solved in the related technique documented by D13, wherein the galvannealing technique utilizes a gas fired U-shaped furnace through which the strip is running; during the heating operation, the furnace is closed laterally by a door; said door can be opened, providing an opening in one end of the U-shaped furnace whereby the furnace may be moved laterally to pass the running length of the strip through the coil opening to enable the furnace to be removed from the line.

Moreover, it was also generally known to people skilled in the art, for instance from D2 (see page 87, last paragraph and Figure 52(b); see also Figures 53 and 54 and the corresponding text), that there are split inductor coil systems which include coil parts which are movable and which allow to displace the coil system from a position around the workpiece to be submitted to induction heating to a non-use position while the

workpiece remains in position. In particular, as stressed by the appellant, there are movable parts of the split inductors in Figure 54 which have the function of a door means, which door means carries connector means defining a part of the conductor means of the inductor.

4.1.2 The question is, whether the person skilled in the art of electric inductors galvanneal furnaces of D11, aware of the gas fired galvanneal furnace technique of D13, would be prompted to adapt his induction coil furnace means of D11 to obtain the same advantages as those provided by the openable gas furnace of D13 and thus take into account door means of the type otherwise known for instance from D2.

The respondent has credibly argued as follows in this respect:

The technique of D2 relates to split inductors which, contrary to that of D11, D6 or the patent in suit, is for treating stationary workpieces such as for instance journals of crank-shafts, and not for treating strips remote from the inductor coil and running through the opening of the coil. This technique does not belong to the same technical field as for instance D6 or D11, and it is already old and well established, as can be seen from the printing date mentioned in D2, i.e. 1969.

The technique of galvannealing with electric induction furnaces is also well known and old, D11 being in most respects similar to D6, which was published already in 1961.

Door means in galvannealing furnaces were only made available to the public about 1980, as shown in D13, but related to gas furnaces and not to electric induction furnaces.

Thus, until the oldest priority date claimed in the patent in suit, i.e. 3 April 1987, several years passed before the present inventors developed a galvannealing electric induction furnace with door means, and it is only with the benefit of hindsight that it can be argued that it would have been obvious to take into account, after such a period of time, the door means system of D13 and adapt it to a combination of different, much older techniques.

Secondary indications supporting that conclusion can be found in the fact, documented by the submitted statistics, which have not been contested by the appellants, that the gas flame galvannealing technique was the only relevant technique which was commercially in use before the oldest priority date, and that the electric induction galvannealing technique showed a large expansion after that, this being also shown by the commercial success of the firms of the respondents. The merit of the present inventors is not less important if, as argued by the appellants, there had been developments in the needs of the markets or, independently, new electric power sources convenient for this technique had been made available, because, in any case, in a disputed market, the present inventors were the first to develop and patent galvannealing electric induction furnaces with door means and the advantages thereof.

4.2 The appellants' arguments based on the gas galvannealing furnace with door means of D13 as a starting point and transposition thereof to the otherwise known electric galvannealing furnace of D11 (or D6) with implementation of door means according to D2 are not convincing either, because, for the same

reasons as set forth here above, such a transposition and combination of techniques can be considered as obvious only with the benefit of hindsight, which is not allowable when assessing inventive step.

The appellants' objections that one of the objects mentioned in the patent in suit concerning means for accurately positioning the coils relative to the running strip was not solved by the independent claims of the patent in suit, but by dependent claims, cannot convince either because, as credibly argued by the respondents, at least one of the mentioned main objects of allowing the furnace to be displaced from/to the running strip was indeed solved by the main claims.

4.3 Therefore, the subject-matter of claim 1 in dispute is considered as involving an inventive step in the sense of Article 56 EPC and, consequently, it is patentable in the sense of Article 52(1) EPC.

4.4 The subject-matter of claim 14 of respondents main request, which expresses in method terms the technique of claim 1 in dispute, is also allowable for the same reasons.

5. Therefore, taking into account the amendments provided by the respondents in their main request, the European patent can be maintained in amended form (Article 102(3) EPC).

6. Consequently, it is not necessary to take into consideration any further request of the respondents.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form as follows:

   - claims 1 to 13 of the patent as granted,

   - claim 14 as presented during the oral proceedings of 1 October 1998, and

   - description and drawings as granted.

The Registrar:

P. Martorana

The Chairman:

E. Turrini