BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File Number: T 875/91 - 3.5.2

Application No.: 83 304 285.6

Publication No.: 0 100 638

Title of invention: Laser treatment of electrical steel

Classification: H01F 1/18

D E C I S I O N
of 10 March 1993

Applicant: Thyssen Stahl AG

Headword:

EPC Article 56; Rule 63(1)

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

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 875/91 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 10 March 1993

Appellant : (Opponent)
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Decision under appeal :
Decision of the Opposition Division of the European Patent Office dated 9 September 1991 rejecting the opposition filed against European patent No. 0 100 638 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : J.A. van Voorthuizen
Members : M.R.N. Villemin
B.J. Schachenmann

Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division rejecting his opposition to the European Patent No. 0 100 638.

II. Claim 1 reads as follows:

"1. A process for improving the core loss of magnetic materials of the type having a plurality of magnetic domains and an insulative coating thereon of a mill glass, an applied coating, or an applied coating over a mill glass, said process being characterized by the step of momentarily irradiating said magnetic materials having said insulative coating thereon with a continuous wave laser so as to subdivide said magnetic domains without damage to said insulative coating."

III. The following prior art documents cited in support of the opposition remain relevant in the present appeal:

D1: US-A-4 293 350
D3: EP-A-0 033 878.

With the Statement of the Grounds of Appeal the Appellant filed the following additional document:

D8: DE-A1-3 039 544.

IV. Oral proceedings were held on 10 March 1993.

V. The Appellant argued essentially as follows:

Document D1 disclosed that it was possible to irradiate a magnetic material with a pulse laser without completely destroying its insulative coating. Therefore the prior art

had already solved the problem of avoiding damage to the material's coating and the patent in suit was essentially concerned with the problem of adapting the method known from D1 to the high speed of commercial production lines. Since D8 acknowledged that a magnetic material could also be irradiated with a continuous wave laser (CW-laser) and, furthermore, it was generally known that a CW-laser with its constant power output could be more easily matched to production line speeds than a pulse laser, it would be obvious for the skilled person to replace the pulse laser in the process according to D1 with a CW-laser and thus arrive at the subject-matter claimed in the contested patent without exercising any inventive activity.

VI. The Respondent's arguments can be summarised as follows:

The invention taught that by irradiating magnetic materials with a CW-laser it was possible not only to improve the core loss reduction but also to avoid damage to the insulative coating of the magnetic materials and, at the same time, meet the requirements of high speed production lines. None of the prior art documents was concerned with the problem of avoiding damage to the insulative coating of magnetic materials. D1 merely disclosed that irradiation with a pulse laser caused less damage to the insulative layer than conventional mechanical processes for domain subdivision, such as marking-off or scratching. Though D3 and D8 referred to the possible use of a CW-laser in a process for reducing the core loss of magnetic materials, it was clearly stated in both documents that pulse lasers were to be preferred.

VII. The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 100 638 be revoked.

VIII. The Respondent requested that the appeal be dismissed and the patent be maintained as granted (main request) or on the basis of Claim 8 (auxiliary request), and that an apportionment of costs be ordered in view of the Appellant's late filing of document D8.

Reasons for the Decision

1. The appeal is admissible.

2. The main issue to be considered in the present appeal is whether the subject-matter claimed in the contested patent involves an inventive step.

2.1 Document D1 discloses a process for subdividing the magnetic domains and thus improving the core loss of magnetic materials provided with an insulative coating by irradiating their surface with a pulse laser (D1, column 6, lines 7 to 16 and column 7, lines 13 to 15). According to D1 the irradiation with the laser beam generates "minute strains in the sheets, without destroying the insulating film completely" (D1, column 7, lines 15 to 18). The Appellant referred to the above statement and to the absence of the mentioning of a recoating step in the prior art process to show that it was already known to irradiate magnetic materials with a conventional pulse laser without causing damage to the insulative coating and that, consequently, the contested patent merely addressed the problem of adapting the process according to D1 to the high speed of commercial production lines.

2.2 In the opinion of the Board the statement in D1 that the insulative coating is not "completely" destroyed may mean either that the coating is completely blown off only in the regions irradiated by the laser beam or that the

extent of the damage in such regions is limited to the top layer of the insulative coating. Either interpretation is compatible with the general teaching of D1 which is essentially directed to improving "the conventional, marking-off process or scratching process, in which processes the indentations are formed on the insulating film, which is destroyed due to the scratching and the like" (D1, column 7, lines 20 to 24). The pulse widths recommended in D1 range from 1 ns to 10 ms and therefore cover both Q-switched lasers and conventional pulse lasers. From this document the skilled person, knowing the different characteristics of Q-switched lasers and conventional pulse lasers, could at the most infer that irradiation with a conventional pulse laser having longer pulse duration (pulse width), lower repetition rate and smaller instantaneous peak power could reduce the damage to the coating to such an extent as to make a recoating of the materials not under all circumstances required. He would also expect, however, that a reduced damage would go together with lower processing speeds.

Hence, starting from D1 the objective problem underlying the contested patent is to find a process for inducing domain subdivision in a magnetic material which does not cause any damage to the insulative coating and is also suitable for high speed production lines.

2.3 According to the patent in suit the problem is solved by irradiating the magnetic material with a CW-laser, which, as submitted by the Respondent and not disputed by the Appellant, not only provides a satisfactory core loss reduction without damage to the coating but allows also the magnetic materials to be processed at the speed of commercial production lines.

2.4 The question to be considered now is whether the skilled person addressing the above problem would find it obvious, in the light of the cited prior art, to arrive at the solution according to Claim 1 of the patent in suit.

D3 and D8, which relate to a process for reducing the core loss of magnetic materials by irradiating their surface with a laser beam, are not concerned with the problem of avoiding damage to the materials' insulative coating. According to D3 optimum core loss is obtained when the laser beam irradiation is carried out to such an extent that laser marks are formed on the surface. In order to avoid deterioration in the insulating property of the materials due to vaporisation of the insulating film, D3 suggests to carry out the laser beam irradiation prior to the formation of the insulating film. Also in the process according to D8 the laser beam is said to leave marks on the material (D8, page 14, lines 8 to 10). Though the possibility of irradiating the magnetic materials with a CW-laser is acknowledged in both documents, a pulse laser is considered to provide better results (D3, page 9, lines 23 to 28 and D8, page 20, lines 5 to 6).

2.5 The Appellant, assuming that the problem of not causing any damage to the insulative coating had already been solved in D1, argued that the skilled person faced with the problem of adapting the process according to D1 to the higher speed of commercial production lines would find it obvious to arrive at the solution defined in the Claim 1 of the contested patent. In his view not only D1 but also D8 contained a clear reference to the fact that the irradiation of the magnetic sheets with a pulse laser did not cause such damage as to require a recoating with an insulative layer. Moreover, since D8 acknowledged that a pulse laser could be replaced with a CW-laser, it would be obvious for the skilled person to realise that a CW-laser

with its easier control parameter was better suited to the speed of commercial production lines than a pulse laser.

2.6 In the opinion of the Board, however, neither the reference in D1 to the limited damage caused to the coating by a pulse laser nor the suggestion in D8 (cf. page 20, lines 13 to 15) that a coating can (but need not) be provided after the irradiation with a laser beam necessarily mean that the problem of avoiding any damage to the insulative layer should be considered as having been solved in the prior art. Even if it is admitted that the skilled person might expect that a conventional pulse laser with an appropriately low pulse repetition rate would not cause any serious damage to the insulative coating of a magnetic material, nothing suggests that he would find it obvious to consider its use in a process apt to produce an effective core loss reduction. In fact, the prior art disclosures seem to support the impression that some kind of damage was considered inevitable for achieving a good core loss reduction. In D3 a pulse laser is said to be preferred, "since the object of the laser beam irradiation is to subdivide the magnetic domain as a result of impact exerted on the sheet surface (emphasis added)" (D3, page 9, lines 23 to 26). Furthermore, the domain subdivision is explained as a result of "strong elastic and plastic waves" generated in the sheet by "a high power laser" (D3, page 6, lines 28 to 30). The pulse widths disclosed in D1 and D8 (respectively 1 ns to 10 ms and 1 ns to 1 ms) are in a range that applies to Q-switched lasers and conventional pulse lasers. However, in the examples where this parameter is defined the values fall within the range proper to Q-switched lasers, which are known to blow off the insulative coating.

2.7 In brief, the prior art clearly shows that pulse lasers were considered more effective than CW-lasers in a process

for reducing core loss through magnetic domain sub-division and there is no suggestion that a CW-laser could be successfully employed to achieve good core loss reduction at viable production line speeds and without damage to the insulative coating, or that there would be any obvious reason for replacing in the known process the pulse laser with a CW-laser. Therefore in the opinion of the Board the subject matter of Claim 1 involves an inventive step as defined in Article 56 EPC and, consequently, the patent in suit can be maintained unamended in accordance with the Respondent's main request.

3. Since the main request is allowable there is no need for the Board to consider the auxiliary request.

4. As to the request for an apportionment of costs as provided in Rule 63(1) EPC in view of the late filing of D8, the Board agrees with the Respondent that facts and evidence in support of an opposition which are presented after the nine-month period for filing an opposition and which cause the incurring of additional costs by another party may for reasons of equity justify an order for apportionment of costs (cf. T 117/86, OJ EPO 10/89, 401). In the present case, however, document D8 was submitted by the Appellant with the Statement of Grounds of Appeal in response to some arguments in the appealed decision. Moreover, since the additional information of any relevance to the present case provided by D8 is essentially limited to the explicit mention of CW-lasers, in the opinion of the Board, the Respondent's representative is not likely to have incurred any substantial additional costs. Hence, the request for an apportionment of costs is not allowed.

Order

For these reasons, it is decided that:

1. The appeal is dismissed.

2. The request for apportionment of costs is dismissed.

The Registrar: The Chairman:

M. Kiehl J.A. van Voorthuizen