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File No.: T 0775/91 - 3.2.5  
Application No.: 83 106 235.1  
Publication No.: 0 098 492  
Classification: B21B 1/08  
Title of invention: Method for the production of railway rails by  
accelerated cooling in line with the production  
rolling mill

**D E C I S I O N**  
of 22 October 1993

Patentee: The Algoma Steel Corporation, Limited  
Proprietor of the patent:  
Opponents: 01: British Steel plc  
02: Centre de Recherches Metallurgiques  
Association sans but lucratif à BRUXELLE  
(BELGIQUE)  
Headword:  
EPC: Art.54,56  
Keyword: "Novelty (no)" - "Inventive step (no)"

**Headnote**  
**Catchwords**



Case Number: T 0775/91 - 3.2.5

**DECISION**  
of the Technical Board of Appeal 3.2.5  
of 22 October 1993

**Appellant:**  
(Opponent)

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**Representative:**

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**Respondent:**

(Proprietor of the patent)

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**Decision under appeal:**

Decision of the Opposition Division of the  
European Patent Office dated 19 August 1991  
rejecting the oppositions filed against European  
patent No. 0 098 492 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** C.V. Payraudeau  
**Members:** H.J. Seidenschwarz  
A. Burkhardt

**Summary of Facts and Submissions**

I. By the decision under appeal the Opposition Division rejected the two oppositions filed against the European patent No. 0098 492.

The independent Claims 1 and 18 of the patent as granted read as follows:

"1. A method for heat treating railroad rails to produce a metallurgical structure composed primarily of finely spaced pearlite in the rail head of railroad rails, by the accelerated cooling of railroad rails from an initial temperature above the austenite to ferrite transformation temperature, wherein the method comprises the steps of:

(a) subjecting the head portion (6) of a rail to intermittent forced cooling by passing said rail through a series of alternating cooling headers (1a, 1b) utilizing a liquid cooling medium and zones of interrupted cooling in such a manner that the near surface region of said rail is maintained essentially above the martensite formation temperature, during said intermittent forced cooling: and

(b) terminating the application of liquid cooling medium when the head portion (6) of the rail has reached a predetermined cooling stop temperature, said cooling stop temperature being higher than the martensite formation temperature"

"18. Apparatus for accelerated cooling of a railroad rail passing longitudinally through said

apparatus from an initial temperature above the austenite to ferrite transformation temperature, to improve the metallurgical properties thereof by producing a metallurgical structure composed primarily of finely spaced pearlite in the rail head of the rails comprising:

(a) means for subjecting the head portion of a rail to intermittent forced cooling, in such a manner that the near surface region of said rail is maintained essentially above the martensite transformation temperature, said means comprising a series of cooling headers longitudinally spaced from one another by zones of interrupted cooling of selected lengths, the cooling headers being operable to apply a liquid cooling medium to the rail thereby to afford a relatively high rate of cooling of the rail as it passes each of the cooling headers, the zones of interrupted cooling controlling the rate of cooling of said rail to a relatively low figure as it passes through each of such zones;

(b) transport means for passing the rail longitudinally along the series of cooling headers and zones of interrupted cooling such that the head portion of the rail may be subjected to the liquid cooling medium; and

(c) control means for terminating the application of the liquid cooling medium when the head portion of the rail has reached a predetermined cooling stop temperature."

II.1 The Appellants (Opponent 01 and 02) appealed against said decision and requested the cancellation of the impugned decision and revocation of the patent.

The Appellants refer to the following documents:

D1: SU-A-0 657 883, English translation

D8: Metals Handbook, 8th Edition, Volume 1, ASM, 1961,  
page 35; 9th Edition, 1985, Volume 9,  
Catchword: sorbite;

II.2 Their arguments can be summarised as follows:

The subject-matter of Claim 1 is not novel with respect to document D1 or at least does not involve an inventive step having regard to the teaching as disclosed by document D1 in combination with the knowledge of the man skilled in the art as disclosed by document D8.

II.3 Copies of the Statements of Grounds were forwarded to the Respondent with the communication of 8 January 1992 which also stated that any submissions in answer to the appeals must be filed within four months. However, the Respondent has not commented on the appeals.

### Reasons for the Decision

1. The patent in suit relates to a method and an apparatus to produce wear resistant railway rails having a metallurgical structure composed of very finely spaced pearlite or a combination of very fine pearlite with a small volume fraction of bainite (see patent specification col. 1, lines 1 to 21).
2. According to the description of the patent (see patent specification col.1, lines 35 to 64), the known successful methods for obtaining such rails are very expensive as they require either reheating of the rolled

rail sections or alloying the standard carbon-manganese rail steels. They all also suffer from low productivity rates. The early attempts to solve this problem by submitting the rail to an accelerated cooling as it leaves the hot rolling mill have been unsuccessful as they fail to achieve a satisfactory product uniformity (see patent specification col. 2, lines 19 to 24).

3. Therefore, the technical problem which the patent in suit aims to solve is to propose a method and an apparatus for producing wear resistant rails avoiding the above mentioned drawbacks of the known methods and apparatus.
4. According to the independent Claims 1 and 18 of the patent as granted, the aforementioned problem is solved by (1) subjecting the head portion of a rail to an "intermittent forced cooling" in such a manner that the near surface region of the rail is **maintained essentially above the martensite formation temperature** during this forced cooling, and (2) terminating the "intermittent forced cooling" when the head portion has reached a **predetermined cooling stop temperature which is higher than the martensite formation temperature.**
5. Document D1 discloses a method for heat treating railroad rails passing at a speed of 26mm/sec through an apparatus which comprises a series of cooling headers longitudinally spaced from one another by zones of interrupted cooling of selected lengths. The medium for intermittent cooling of the head portion of the rails is water at 55°C. This head portion is however "not supercooled". This accelerated intermittent forced cooling results in a **sorbite or troosto-sorbite** structure with uniformly distributed hardness in the near-surface region of the head portion (cf. page 2, lines 5 to 25; page 3, lines 1 to 4 and 16 to 26).

According to the "Metals Handbook" (document D8) **sorbite** is a fine mixture of ferrite and cementite produced either by:

- (1) regulating the rate of cooling or
- (2) tempering steel after hardening.

In case(1) **sorbite** is very fine **pearlite** whereas in case(2) **sorbite** is tempered martensite.

Therefore in the case that a **sorbite** structure is obtained by the cyclic cooling according to the method known from document D1, this cooling has been interrupted and terminated at a temperature which is above the **martensite** formation temperature having regard to case(1) of the definitions given above.

6. Consequently, with respect to the method according to document D1, the subject-matter of Claim 1 of the patent as granted is not new within the meaning of Article 54 EPC.
7. Furthermore, the subject-matter of independent Claim 18, which concerns an apparatus for accelerated cooling of a railroad rail according to the method as defined in Claim 1, does not involve an inventive step within the meaning of Article 56 EPC.

It is obvious to the person skilled in the art that an apparatus having means for subjecting the head portion of a rail to intermittent forced cooling and for transporting this rail longitudinally along said cooling means as disclosed by document D1 comprises also control means for terminating the application of the water when the head position of the rail has reached a predetermined cooling stop temperature in order to

obtain a specified hardness in the surface and a **sorbite** structure with improved hardenability across the whole section of the quenched layer and minimum residual stress (cf. page 2, lines 12 to 25).

8. Consequently, the patent cannot be maintained.

**Order**

**For these reasons, it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:



A. Townend

The Chairman:



C. Payraudeau