(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 462 380 A3**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **91106841.9**

(51) Int. Cl.5: **C21D 8/04**

(22) Date of filing: **26.04.91**

(30) Priority: **20.06.90 JP 159856/90**

(43) Date of publication of application:
27.12.91 Bulletin 91/52

(84) Designated Contracting States:
BE DE ES FR GB IT NL

(88) Date of deferred publication of the search report:
06.10.93 Bulletin 93/40

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(54) **Method of producing high-strength cold-rolled steel sheet suitable for working.**

(57) A method of producing a high-strength cold-rolled steel sheet suitable for working uses which utilizes a steel material having the following composition: not more than 0.02 wt% of C, not more than 1.0 wt% of Si, not more than 2.0 wt% of Mn, and not less than 0.01 wt% but not more than 0.10 wt% of Ti, the Ti, C and N contents being determined to meet the condition of Ti > (48/12) C wt% + (48/14) N wt%, the steel also consisting essentially of not less than 0.0010 wt% but not more than 0.0100 wt% of Nb, not less than 0.0002 wt% but not more than 0.0020 wt% of B, not less than 0.03 wt% but not more than 0.20 wt% of P, not more than 0.03 wt% of S, not less than 0.010 wt% but not more than 0.100 wt% of Aℓ, not more than 0.008 wt% of N, not more than 0.0045 wt% of O, and the balance substantially Fe and incidental inclusions. The steel material is cast and hot-rolled and then subjected to a cold rolling conducted at a sheet temperature not higher than 300 °C under such a condition that the sum of the rolling reductions of passes which meet the following condition between said sheet temperature (T °C) and the strain rate $\dot{\epsilon}$ (S^{-1}) is 50 % or greater:

$$T \times \dot{\epsilon} \geqq 50{,}000\ ^\circ C\ S^{-1}$$

The steel sheet is then continuously annealed or galvannealed.

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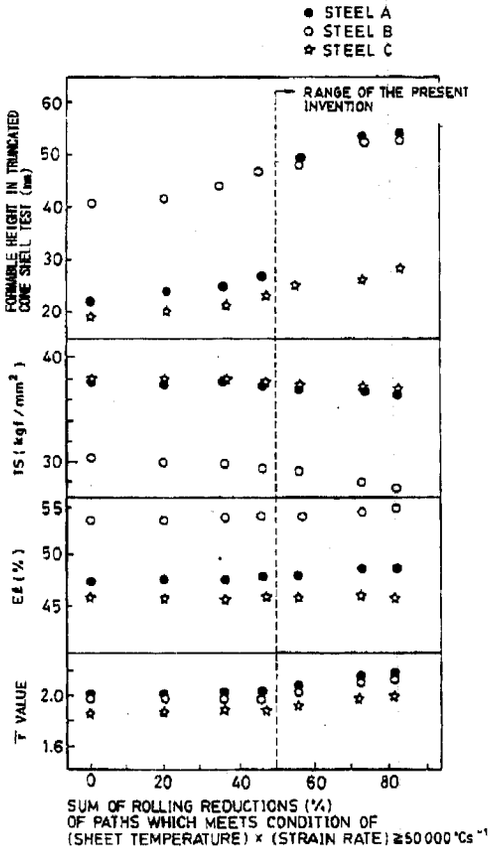
FIG. 1


● STEEL A
○ STEEL B
☆ STEEL C
RANGE OF THE PRESENT INVENTION
FORMABLE HEIGHT IN TRUNCATED CONE SHELL TEST (mm)
60
50
40
30
20
TS (kgf / mm²)
40
30
El (%)
55
50
45
r̄ VALUE
2.0
1.6
0
20
40
60
80
SUM OF ROLLING REDUCTIONS (%)
OF PATHS WHICH MEETS CONDITION OF
(SHEET TEMPERATURE) × (STRAIN RATE) ≧ 50 000 °Cs⁻¹

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 10 6841

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A D	EP-A-0 295 697 (KAWASAKI STEEL) * claim 3 * & JP-A-63 317 648 (KAWASAKI STEEL)	1	C21D8/04
A D	PATENT ABSTRACTS OF JAPAN vol. 7, no. 91 (C-162)(1236) 15 April 1983 & JP-A-58 019 442 (NIPPON KOKAN) 4 February 1983 * abstract * & JP-B-61 011 294 (NIPPON KOKAN)	1	
A D	PATENT ABSTRACTS OF JAPAN vol. 9, no. 52 (C-269)(1775) 6 March 1985 & JP-A-59 193 221 (SHIN NIPPON SEITETSU) 1 November 1984 * abstract * & JP-B-01 028 817 (SHIN NIPPON SEITETSU)	1	
A	EP-A-0 194 118 (KAWASAKI STEEL) * claim 1 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 316 (C-524)26 August 1988 & JP-A-63 086 819 (KAWASAKI STEEL) 18 April 1988 * abstract *	1	C21D
A	GB-A-2 111 419 (NIPPON STEEL)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	26 JULY 1993	SUTOR W.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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