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Title: **COLD ROLLED STEEL SHEET** AND GALVANIZED **STEEL SHEET** HAVING STRAIN AGING HARDENING PROPERTY AND **METHOD** FOR PRODUCING THE SAME

Abstract: An object of the present invention is to provide a **cold-rolled steel sheet** and an alloyed **hot-dip** galvanized **steel sheet** in which tensile strength is effectively increased by press forming and **heat** treatment while maintaining excellent deep drawability in press forming. Specifically, a **steel** composition contains less than 0.01 percent of C, 0.005 to 1.0 percent of **Si**, 0.01 to 1.0 percent of **Mn**, 0.005 to 0.050 percent of Nb, 0.005 to 0.030 percent of Al, 0.005 to 0.040 percent of N, 0.0005 to 0.0015 percent of B, 0.05 percent or less of P, and 0.01 percent or less of S, the balance substantially composed of Fe, in which the following equations (1) and (2) are satisfied: N percent greater than or equal to 0.0015+14/93.Nb percent +14/27.Al percent +14/11.B percent (1) C percent less than or equal to (12/93).Nb percent (2)

Classifications:

International (IPC 8-9): B21B3/00 C21D1/26 C21D6/00 C21D8/02 C21D8/04 C21D9/46 C21D9/48 C21D9/52 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/12 C22C38/14 C22C38/16 C22C38/38 C22C38/58 (Advanced/Invention);

C21D1/18 C22C38/00 (Advanced/Non-invention);

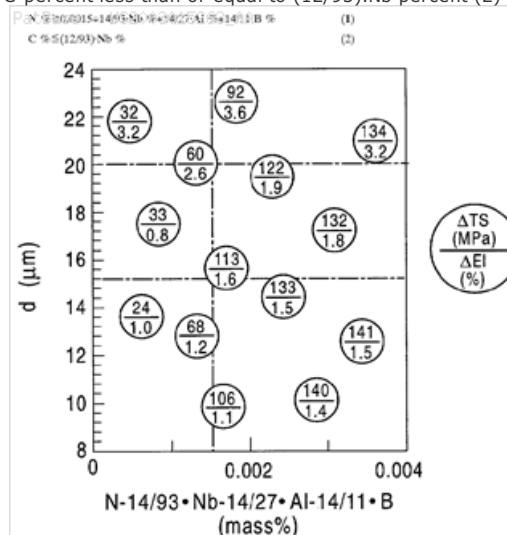
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International (IPC 1-7): B21B3/00 B32B15/00 C21D1/26 C21D6/00 C21D8/00 C21D8/02 C21D9/46 C21D9/48 C21D9/52 C22C38/00 C22C38/04 C22C38/06 C22C38/08 C22C38/12 C22C38/14 C22C38/16 C22C38/38 C22C38/58

CPC: Y10T428/12493 Y10T428/12799 C21D8/0436 C21D1/185 C21D8/0226 C21D8/0236 C21D8/0273 C21D8/0426 C21D8/0473 C21D9/46 C21D9/48 C21D211/005 C21D211/008 C22C38/001 C22C38/004 C22C38/02 C22C38/04 C22C38/06 C22C38/12

European: C21D8/02D6 C21D8/02F8 C21D8/04D2 C21D8/04D6 C21D9/46 C21D9/48 C22C38/00B C22C38/00D C22C38/02 C22C38/04 C22C38/06 C22C38/12 M21D1/18B M21D211/00F M21D211/00M M21D8/02D2 M21D8/02F8 M21D8/04D2 M21D8/04D6 M21D8/04F8

US: 148/32 148/320 148/320S 148/330 148/333 148/336 148/336S 148/603 148/651 148/651S 148/652 420/128 428/615 428/615P 428/659 428/659S



Family:

Publication number	Publication date	Application number	Application date
CA2379698 AA	20020117	CA20012379698	20010214
CA2379698 C	20090217	CA20012379698	20010214
CN1158398 C	20040721	CN20018002186	20010214
CN1386140 A	20021218	CN20018002186	20010214
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JP4665302 B2	20110406	JP20000335803	20001102
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TW565621 B	20031211	TW20010103293	20010214
US2003015263 AA	20030123	US20020031426	20020118
US2004050461 AA	20040318	US20030655361	20030904
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US2004103962 AA	20040603	US20030654774	20030904
US2004105997 AA	20040603	US20030655394	20030904
US2004261920 AA	20041230	US20030655288	20030904
US7067023 BB	20060627	US20030655361	20030904
US7101445 BB	20060905	US20030654775	20030904
WO0190431 A1	20011129	WO20011P01004	20010214

Priority:

JP20000055146	20000301	JP20000156274	20000526	JP20000193717	20000628
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WO2001JP01004	20010214	JP20010057153	20010301	JP20010227068	20010727
US20020031426	20020118	US20030655361	20030904	US20030654774	20030904
US20030654775	20030904	US20030655288	20030904	US20030655394	20030904

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): JFE HOLDINGS INC ; JFE STEEL CORP ; KAMI CHIKARA ; KAWASAKI STEEL CO ; KAWASAKI STEEL

CORP ; KAWASAKI STEEL CORP A CORP OF ; YAMAZAKI TAKUYA ; TOSAKA AKIO

Assignee(s): KAWASAKI STEEL A CORPORATIN OF JAPAN CORP ; KAWASAKI STEEL CORP ; KAWASAKI STEEL A OF JAPAN CORP ; HONDA GIKEN KOGYO KK ; HONDA MOTOR CO LTD

Inventor(s): (std): AKIO TOSAKA ; CHIKARA KAMI ; KAMI CHIKARA ; KAMI TSUTOMU ; TAKUYA YAMAZAKI ; TOSAKA AKIO ; YAMAZAKI TAKUYA

Inventor(s): YAMAZAKI ; KAMI CHIKARA C ; KAMI

Agent(s): MOFFAT AND CO; DLA PIPER RUDNICK GRAY CARY US LLP; GRAY CARY US LLP; DLA PIPER RUDNICK

Designated states: AT BE CA CH CN CY DE DK ES FI FR GB GR IE IT KR LU MC NL PT SE TR US

Title: **METHOD** FOR PRODUCING **COLD-ROLLED STEEL SHEET**

Abstract: A **method** for producing a high-tensile **cold-rolled steel sheet** includes subjecting a **slab** having a composition containing C: more than 0.020 percent and less than 0.30 percent, **Si**: more than 0.10 percent and 3.00 percent or less, and **Mn**: more than 1.00 percent and 3.50 percent or less to **hot rolling** wherein the **roll** draft of the final one pass is higher than 15 percent, and **rolling** is finished in the **temperature** region of Ar3 point or higher, optionally **annealing** wherein the **hot-rolled steel sheet** is **heated** to 300 degrees centigrade or higher after being **cooled** to 780 degrees centigrade or lower, **coiling** higher than 400 degrees centigrade or lower than 400 degrees centigrade, **cold rolling** the **hot-rolled steel sheet** or the **annealed steel sheet**, and **annealing** wherein the **cold-rolled steel sheet** is **soaked** in the **temperature** region of (Ac3 point-40 degrees centigrade) or higher, **cooling** to 500 degrees centigrade or lower and 300 degrees centigrade or higher, and holding in that **temperature** region for 30 seconds or longer.

Classifications:

International (IPC 8-9): B21B B21B3/00 C21D C21D8/02 C21D8/04 C21D8/12 C21D9/46 C22C C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/12 C22C38/38 (Advanced/Invention);

C21D9/46 (Core/Invention);

B21B C21D C22C (Subclass/Invention)

CPC: C22C38/001 C22C38/02 C22C38/04 C22C38/06 C22C38/12 C21D8/0273 C21D2211/003 C21D8/1261 C21D8/0247 C21D8/0236 C21D9/46

US: 148/603 148/651

PatBase - US2014238557_AA

Fig. 1

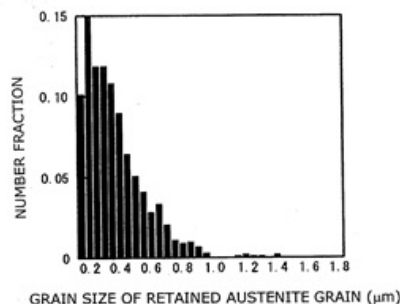
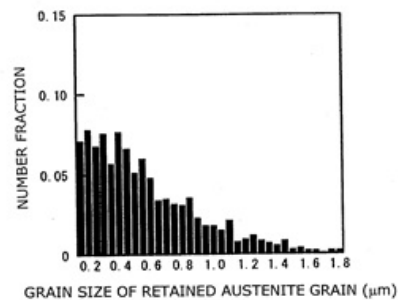


Fig. 2



Family:

Publication number	Publication date	Application number	Application date
BR112014000086 A2	20170214	BR20141100086	20120702
CA2841056 AA	20140106	CA20122841056	20120702
CA2841056 C	20160809	CA20122841056	20120702
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EP2730666 A1	20140514	EP20120807151	20120702
EP2730666 A4	20151007	EP20120807151	20120702
EP2730666 B1	20180613	EP20120807151	20120702
IN00346DN2014 A	20150102	IN2014DN00346	20140115
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JP2013014827 A2	20130124	JP20110150248	20110706
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KR20140033226 A	20140317	KR20147003044	20120702
MX2014000125 A1	20140709	MX20140000125	20120702
RU2014104098 A	20150820	RU20140104098	20120702
RU2563397 C2	20150920	RU20140104098	20120702
TH146529 A	20160304	TH20141000036	20120702
US2014238557 AA	20140828	US20120130568	20120702
WO13005714 A1	20130110	WO2012JP66878	20120702
ZA201400360 A	20141126	ZA20140000360	20140116

Priority:

JP20110150241 20110706

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JP20110150244 20110706 JP20110150247 20110706 JP20110150248 20110706
JP20120138138 20120619 JP20120138139 20120619 EP20120807151 20120702
WO2012JP66878 20120702

Probable Assignee: NIPPON STEEL AND SUMITOMO METAL CORP

Assignee(s): (std): HAGA JUN ; HATA KENGO ; IMAI NORIO ; NIPPON STEEL AND SUMITOMO METAL ; TOMIDA TOSHIRO ; NIPPON STEEL AND SUMITOMO METAL CORP ; TANAKA YASUAKI ; WAKITA MASAYUKI ; YOSHIDA MITSURU ; NISHIO TAKUYA ; NIPPON STIL EHND SUMITOMO METAL CORP

Assignee(s): NIPPON STIL EHND SUMITOMO METAL KORPOREJSHN

Inventor(s): (std): NORIO IMAI ; TAKUYA NISHIO ; TANAKA YASUAKI ; TOMIDA TOSHIRO ; TOMITA TOSHIRO ; TOSHIRO TOMIDA ; WAKITA MASAYUKI ; YASUAKI TANAKA ; YOSHIDA MITSURU ; VAKITA MASAJUKI ; TOMIDA TOSIRO ; TANAKA JASUAKI ; NISIO TAKUJA ; KHATA KENGO ; KHAGA DZUN ; IMAJ NORIO ; HAGA JUN ; HAGA JUN ; HATA KENGO ; IAMI NORIO ; IMAI NORIO ; JOSIDA MITSURU ; JUN HAGA ; KENGO HATA ; MASAYUKI WAKITA ; MITSURU YOSHIDA ; NISHIO TAKUYA

Inventor(s): NORIO IAMI

Agent(s): GOWLING LAFLEUR HENDERSON LLP; GOWLING WLG CANADA LLP; ZIMMERMANN AND PARTNER
PATENTANWAELTE MBB; ZIMMERMANN AND PARTNER; HIROSE SHOICHI

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: HIGH STRENGTH **STEEL SHEET** HAVING EXCELLENT FORMABILITY AND **METHOD** FOR PRODUCTION THEREOF

Abstract: A high strength **steel sheet** having (2-1) a base phase structure, the base phase structure being tempered martensite or tempered bainite and accounting for 50 percent or more in terms of a space factor relative to the whole structure, or the base phase structure comprising tempered martensite or tempered bainite which accounts for 15 percent or more in terms of a space factor relative to the whole structure and further comprising ferrite, the tempered martensite or the tempered bainite having a hardness which satisfies the relation of Vickers hardness (Hv) greater than or equal to $500[C] + 30[S] + 3[Mn] + 50$ where [] represents the content (mass percent) of each element, and (2-2) a second phase structure comprising retained austenite which accounts for 3 to 30 percent in terms of a space factor relative to the whole structure and optionally further comprising bainite and/or martensite, the retained austenite having a C concentration (C_{gamma}R) of 0.8 percent or more.

Classifications:

International (IPC 8-9): C21D1/20 C21D1/22 C21D8/02 C21D9/46 C21D9/52 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/58 C23C2/02 C23C2/06 C23C2/28

C23C2/40 (Advanced/Invention);

C21D1/18 (Advanced/Non-invention);

C21D1/18 C21D8/02 C21D9/46 C21D9/52 C22C38/00 C22C38/02

C22C38/04 C22C38/06 C22C38/58 C23C2/02 C23C2/06 C23C2/28

C23C2/36 (Core/Invention)

International (IPC 1-7): C21D8/00 C21D9/46 C22C38/00

C22C38/06 C22C38/58 C23C2/02 C23C2/06 C23C2/28 C23C2/40

CPC: C21D1/185 C21D1/20 C21D1/22 C21D8/0263 C21D8/0273

C21D9/52 C21D2211/002 C21D2211/005 C21D2211/008

C22C38/002 C22C38/02 C22C38/04 C22C38/06 C23C2/02

C21D8/0226

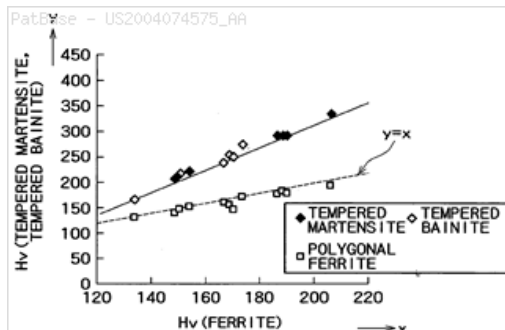
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US: 148/32 148/320 148/333 148/334 148/335 148/336 148/533 148/602 148/651 148/652 148/653 148/654 148/661

148/663



Family:

Publication number	Publication date	Application number	Application date
EP1365037 A1	20031126	EP20020710418	20020131
EP1365037 A4	20050202	EP20020710418	20020131
EP1365037 B1	20080402	EP20020710418	20020131
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JP2002309334 A2	20021023	JP20010300503	20010928
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WO02061161 A1	20020808	WO2002JP00744	20020131

Priority:

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Probable Assignee: KOBE SEIKO SHO KK

Assignee(s): (std): KOBE STEEL LTD ; KASHIMA TAKAHIRO ; NAGASAKA AKIHIKO ; KANDA AKINOBU ; KIKUCHI RYO ; AKAMIZU HIROSHI ; HASHIMOTO SHUNICHI ; IKEDA SHUSHI ; SUGIMOTO KOH ICHI

Assignee(s): KABUSHIKI KAISHA KOBE SEIKO SHO ; KOBE SEIKO SHO KK ; KOBE SEIKO SHO KOBE STEEL LTD KK ; KABUSHIKI KAISHA KOBE SEIKO SHO KOBE STEEL LTD

Inventor(s): (std): AKAMIZU HIROSHI ; HASHIMOTO SHUNICHI ; IKEDA SHUSHI ; KANDA AKINOBU ; KASHIMA TAKAHIRO ; KIKUCHI RYO ; NAGASAKA AKIHIKO ; SUGIMOTO KOH ICHI ; SUGIMOTO KOICHI ; KAJIMA TAKAHIRO ; IKEDA CHIKAYUKI

Agent(s): KYLE DIANA ET AL; OBLON SPIVAK MCCLELLAND MAIER AND NEUSTADT PC

Designated states: FR GB US

Title: HIGH-STRENGTH **COLD ROLLED STEEL SHEET** HAVING EXCELLENT DEEP DRAWABILITY AND BAKE HARDENABILITY AND **METHOD** FOR MANUFACTURING THE SAME

Abstract: A high-strength **cold rolled steel sheet** having excellent deep drawability and bake hardenability, with a tensile strength greater than or equal to 440 MPa, an average r -value greater than or equal to 1.20 and a bake hardening value greater than or equal to 40 MPa, is obtained by subjecting a **steel** raw material having a chemical composition including C: 0.010-0.06 mass percent, **Si**: more than 0C:\Users\ejensen\Desktop\TEMP\5 mass percent but not more than 1.5 mass percent, **Mn**: 1.0-3.0 mass percent, Nb: 0.010-0.090 mass percent, **Ti**: 0.015-0.15 mass percent and satisfying $(Nb/93)/(C/12) < 0.20$ to **hot rolling**, **cold rolling** and then to **annealing** including steps of **heating** to a **temperature** of 800-900 degrees centigrade while a **temperature** region of 700-800 degrees centigrade is an average **heating** rate < 3 degrees centigrade /s, and **soaking** and thereafter **cooling** at a rate greater than or equal to 5 degrees centigrade /s from the **soaking temperature** to a **cooling** stop **temperature** @500 degrees centigrade to thereby form a microstructure including ferrite phase with an area ratio greater than or equal to 70 percent and martensite phase with an area ratio greater than or equal to 3 percent.

Classifications:

International (IPC 8-9): B21B3/00 B21B3/02 C21D8/00 C21D8/04

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C22C38/08 C22C38/12 C22C38/14 C22C38/18 C22C38/20

C22C38/24 C22C38/26 C22C38/28 C22C38/40 C22C38/42

C22C38/46 C22C38/48 C22C38/50 C22C38/58

C22C38/60 (Advanced/Invention);

C21D9/48 C22C38/14 (Core/Invention)

CPC: C22C38/001 C22C38/008 C21D8/005 C22C38/08 C22C38/18

C22C38/24 C22C38/26 C22C38/28 C22C38/20 C22C38/40

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European: C21D8/02D2 C21D8/02D6 C21D8/02F8 C22C38/00

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Family:

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Priority:

JP20100248119 20101105 JP20110227817 20111017 WO2011JP74939 20111028

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): JFE HOLDINGS INC ; JFE STEEL CORP ; KAWASAKI STEEL CO ; KIMURA HIDEYUKI ; NAGATAKI YASUNOBU

Inventor(s): (std): HIDEYUKI KIMURA ; KIMURA HIDEYUKI ; NAGATAKI YASUNOBU ; YASUNOBU NAGATAKI

Agent(s): ROBIC; STEBBING TIMOTHY CHARLES; OGAWA JUNZO ET AL

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: **Method** of manufacturing a **grain-oriented** electromagnetic **steel sheet**

Abstract: An electromagnetic **steel sheet** having a low iron loss and a high magnetic flux density, with silicon, nitrogen and an added element bismuth or germanium prior to secondary recrystallization, to accelerate precipitation of fine BN and silicon nitride, improving the texture of the primary recrystallized **grains** of the **steel sheet** immediately before subjecting it to secondary recrystallization **annealing**, and combining the primary recrystallization **annealing**, **cold rolling** and further the texture improving treatment. Addition of bismuth or germanium or both to the **steel** prior to secondary recrystallization is combined with primary recrystallization **annealing** and warm **rolling** in the presence of limited aluminum and vanadium impurities limited to 0.002 wt percent Al or less and 0.010 wt percent V or less.

Classifications:

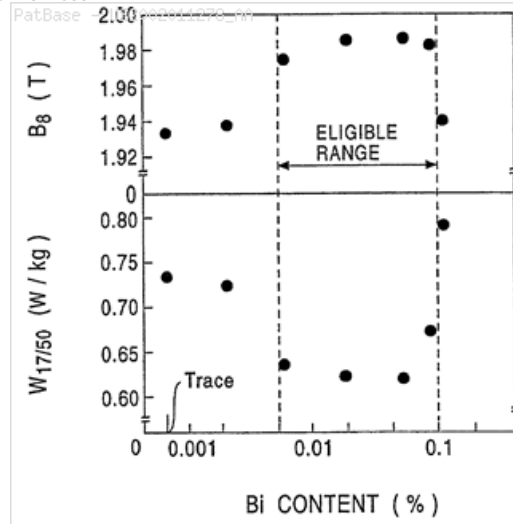
International (IPC 8-9): C21D8/12 C21D9/46 C22C38/00 C22C38/04 C22C38/34 C22C38/60 H01F1/16 (Advanced/Invention); C21D8/12 (Advanced/Non-invention); C21D8/12 C21D9/46 C22C38/00 C22C38/04 C22C38/60 H01F1/12 (Core/Invention)

International (IPC 1-7): C21D8/12 C21D9/46 C22C38/00 C22C38/02 C22C38/04 C22C38/60 H01F1/00 H01F1/04 H01F1/147 H01F1/16

CPC: C21D8/1222 C21D8/1227 C21D8/1233 C21D8/1255 C21D8/1272 C21D8/1288 C21D8/1294 C22C38/04 C22C38/34 C21D8/12

European: C21D8/12 C22C38/04 C22C38/34 M21D8/12D2 M21D8/12D4 M21D8/12D6 M21D8/12F4 M21D8/12F8 M21D8/12H4 M21D8/12L

US: 148/111 148/111S 148/113 148/113S 148/120 148/121 148/121S 148/122 148/122S



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US2002011278 AA	20020131	US20010927030	20010809
US6444051 BB	20020903	US20010927030	20010809

Priority:

JP19980139416 19980521 JP19980144233 19980526 US19990315084 19990519
 KR19990018221 19990520 US20010927030 20010809

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): KAWASAKI STEEL CO

Assignee(s): KAWASAKI STEEL CORP ; JFE HOLDINGS INC ; JFE STEEL CORP ; JFE STEEL CORPORATION

Inventor(s): (std): KUREOSAWA MITSUMASA ; TAMURA KAZUAKI ; KUROSAWA MITSUMASA ; KOMATSUBARA MICHIRO

Inventor(s): KAZUAKI TAMURA ; MICHIRO KOMATSUBARA ; MITSUMASA KUREOSAWA ; MITSUMASA KUROSAWA

Agent(s): SUGIMURA KOSAKU

Designated states: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

Title: **GRAIN-ORIENTED** ELECTRICAL **STEEL SHEET** EXTREMELY EXCELLENT IN MAGNETIC PROPERTIES AND **METHOD** OF PRODUCTION OF SAME

Abstract: Reheating a **grain-oriented** electrical **steel sheet slab** comprising predetermined components to 1280 degrees centigrade or more and a solid solution **temperature** of inhibitor substances or more, **hot rolling**, **annealing**, and **cold rolling** it, decarburization **annealing** it, nitriding it in a strip running state, coating an **annealing** separator, and finish **annealing** it during which making a precipitation ratio of N as AlN after **hot rolling** 20 percent or less, making a mean **grain size** of primary recrystallization 7 μm to less than 20 μm , and making a nitrogen increase ΔN in the nitridation within a range of Equation (1) and making nitrogen contents σN_1 and σN_2 (front and back, mass percent) of a 20 percent thickness portion of one surface of the **steel strip (sheet)** within a range of Equation (2): $0.007 - ([N] - 14/48 \times [Ti])$ less than or equal to ΔN less than or equal to $[solAl] \times 14/27 - ([N] - 14/48 \times [Ti]) + 0.0025$ Equation (1) $|\sigma N_1 - \sigma N_2| / \Delta N$ less than or equal to 0.35 Equation (2)

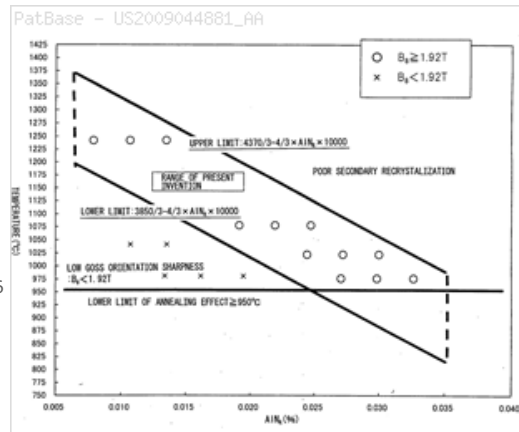
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International (IPC 1-7): C21D8/12

CPC: C21D8/1205 C21D8/1244 C21D8/1261 C21D8/1272 C21D2201/05 H01F1/16 C21D8/12 C22C38/008 C22C38/02 C22C38/04 C22C38/16 C22C38/60 C23C8/02 C23C8/80 H01F1/14791 C22C38/001

European: C21D8/12 C22C38/00G C22C38/02 C22C38/04 C22C38/16 C22C38/60 C23C8/02 C23C8/80 H01F1/147S2 H01F1/16
US: 148/111 148/307 148/307S 148/308



Family:

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EP1889928 A4	20150114	EP20060756610	20060519
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KR20080012957 A	20080212	KR20077028877	20060519
RU2363739 C1	20090810	RU20080100031	20060519
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WO06132095 A1	20061214	WO2006JP310510	20060519

Priority:

JP20050171419 20050610 JP20070520060 20060519 WO2006JP10510 20060519
WO2006JP310510 20060519

Probable Assignee: NIPPON STEEL CORP

Assignee(s): (std): KUMANO TOMOJI ; MURAKAMI KENICHI ; NIPPON STEEL AND SUMITOMO METAL ; NIPPON STEEL AND SUMITOMO METAL CORP ; NIPPON STEEL CORP ; USHIGAMI YOSHIYUKI

Assignee(s): NIPPON STIL KORPOREJSHN ; NIPPON STEEL SUMITOMO METAL CORP

Inventor(s): (std): KENICHI MURAKAMI ; KUMANO TOMODZI ; KUMANO TOMOJI ; MURAKAMI KENITI ; TOMOJI KUMANO ; USHIGAMI YOSHIYUKI ; MURAKAMI KENICHI ; USIGAMI ESJUKI ; YOSHIYUKI USHIGAMI

Inventor(s): MURAKAMI KENICHI C O NIPPON STEEL CORP ; MURAKAMI KENICHI C O NIPPON STEEL CORPORATION TECHNICAL DEVELOPMENT BUREAU ; USHIGAMI YOSHIYUKI C O NIPPON STEEL CORP ; USHIGAMI YOSHIYUKI C O NIPPON STEEL CORPORATION YAWATA WORKS ; KUMANO TOMOJI C O NIPPON STEEL CORP ; KUMANO TOMOJI C O NIPPON STEEL CORPORATION YAWATA WORKS

Agent(s): VOSSIUS AND PARTNER; VOSSIUS AND PARTNER PATENTANWALTE RECHTSANWALTE MBB; AOKI ATSUSHI; ISHIDA TAKASHI; KOGA TETSUJI; PARK JANG WON; KENYON AND KENYON LLP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LC LK LR LS LT LU LV LY MA MC MD MG MK ML MN MR MW MX MZ NA NE NG NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SM SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Title: Method of producing grain oriented silicon steel sheets having magnetic properties

Abstract: The magnetic properties, particularly magnetic flux density of a grain oriented silicon steel sheet are considerably improved by continuously and/or stepwise forming regions, wherein a temperature difference of a secondary recrystallization starting temperature in widthwise direction and/or longitudinal direction of the steel sheet is within a range of 10 degrees C. to 200 degrees C., in the steel sheet at a stage before the secondary recrystallization annealing step.

Classifications:

International (IPC 8-9): C21D8/12 C21D9/46 C21D9/52

H01F1/16 (Advanced/Invention);

C21D8/12 C21D9/46 C21D9/52 H01F1/12 (Core/Invention)

International (IPC 1-7): C21D8/10 C21D8/12 C21D9/46 H01F1/04 H01F1/16

CPC: C21D8/1244 C21D8/1272 C21D9/52 C21D2281/02

European: C21D8/12F C21D9/52 M21D281/02 M21D8/12F8

US: 148/111 148/113

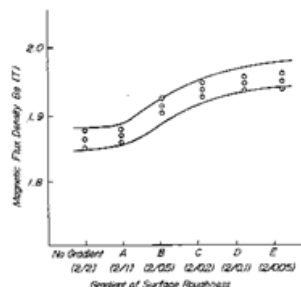
PatBase - US4975127_A

U.S. Patent Dec. 4, 1990

Sheet 1 of 12

4,975,127

FIG. 1



Family:

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Priority:

JP19870112401 19870511	JP19870112402 19870511	JP19870112404 19870511
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Probable Assignee: KAWASAKI STEEL CORP

Assignee(s): (std): KAWASAKI STEEL CO ; KAWASAKI STEEL K K

Assignee(s): KAWASAKI STEEL KK ; KAWASAKI STEEL CORP ; KAWASAKI STEEL CORP KOBE HYOGO ; KAWASAKI STEEL CORP KOBE HYOGO JP

Inventor(s): (std): IIDA YOSHIKI ; IWAMOTO KATSUO ; KATSUO IWAMOTO ; KOBAYASHI YOSHINORI ; KUROSAWA MITSUMASA ; MASAYUKI SAKAGUCHI ; MITSUMASA KUROSAWA ; SAKAGUCHI MASAYUKI ; YOSHIKI IIDA ; YOSHINORI KOBAYASHI

Inventor(s): SAKAGUCHI MASAYUKI CHIBA CITY CHIBA PREF JP ; SAKAGUCHI MASAYUKI CHIBA CITY CHIBA PREF JP ; KUROSAWA MITSUMASA CHIBA CITY CHIBA PREF JP ; KUROSAWA MITSUMASA CHIBA CITY CHIBA PREF JP ; KOBAYASHI YOSHINORI CHIBA CITY CHIBA PREF JP ; KOBAYASHI YOSHINORI CHIBA CITY

CHIBA PREF ; IWAMOTO KATSUO CHIBA CITY CHIBA PREF JP ; IWAMOTO KATSUO CHIBA CITY CHIBA
PREF ; IIDA YOSHIKI CHIBA CITY CHIBA PREF JP ; IIDA YOSHIKI CHIBA CITY CHIBA PREF

Designated states: BE DE FR GB IT SE

Title: **PROCESS** FOR MAKING A LITHIATED LITHIUM MANGANESE OXIDE SPINEL

Abstract: Disclosed is a **process** for making a lithiated lithium manganese oxide spinel of the formula $\text{Li}(1+x)\text{Mn}_2\text{O}_4$ comprising contacting a lithium manganese oxide spinel of the formula LiMn_2O_4 with a lithium carboxylate compound, at a **temperature** and for a **time** sufficient to decompose the carboxylate compound and free the lithium to form said lithiated spinel.

Classifications:

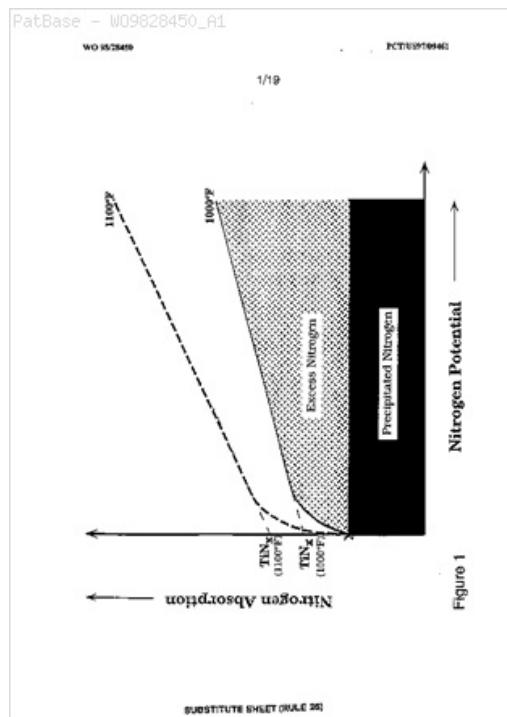
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International (ipc 1-7): C01D15/00 C01D15/02 C01G45/00 C01G45/12 C01G45/13 C21D1/08 C21D8/04 C23C8/26 H01M4/50 H01M4/58

CPC: H01M4/505 C01G45/1242 C01G45/1257 C01P2002/32 C21D8/0457 C23C8/26

European: C01G45/12C6 C01G45/12C8A C21D8/04F4 C23C8/26 H01M4/505 M01P2/32 Y02E60/12B

US: 148/221 148/226 148/228 148/230 148/318 423/599 429/224



Family:

Publication number	Publication date	Application number	Application date
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DE69626023 T2	20031016	DE19966026023T	19960605
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NZ310242 A	19981125	NZ19960310242	19960605
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ZA9603655 A	19961121	ZA19960003655	19960508

Priority:

US19950474806 19950607

WO1996US09461 19960605

US19960773205 19961223

Probable Assignee: UNITED STATES STEEL LLC

Assignee(s): (std): DURACELL INC ; JURASELL INK D ; UEC TECHNOLOGIES LLC ; USS ENG AND CONSULT

Assignee(s): UNITED STATES STEEL LLC ; USX CORP ; BOWDEN WILLIAM L ; D JURASELL INK ; UNITED STATES STEEL CORP ; WANG ENOCH ; USX ENGINEERS AND CONSULTANTS INC ; DURACELL INC US ; GILLETTE CO ; KALLMES ANDREW ; HOLLA HARISH A ; LALLY J SCOTT ; DURACELL INC BETHEL ; DURACELL INC A DELAWARE CORP ; D'JURASELL INK.

Inventor(s): (std): VANG EHNOCH ; KALLMES EHND RJU ; KALLMES ANDREW ; KALLMES A ; BOWDEN WILLIAM L ; BOWDEN W L ; BOWDEN L ; BOUDEN UILL JAM L ; WANG ENOCH ; WANG E ; LALLY SCOTT J ; LALLY J SCOTT ; HOLLA HARISH A

Inventor(s): HARISH A HOLLA ; WILLIAM L BOWDEN ; LALLY J ; W L BOWDEN ; ANDREW KALLMES ; A KALLMES ; WL BOWDEN ; SCOTT J LALLY ; BOUDEN UILL'JAM L. ; ENOCH WANG ; E WANG

Agent(s): SPRUSON AND FERGUSON; ASPEN PHARMA PTY LTD; MACRAE AND CO; BORDEN LADNER GERVAIS LLP

Designated states: AL AM AT AU AZ BB BE BF BG BJ BR BY CA CF CG CH CI CM CN CZ DE DK EE ES FI FR GA GB GE GN GR HU IE IL IS IT JP KE KG KP KR KZ LI LK LR LS LT LU LV MC MD MG MK MN MW MX NL NO NZ PL PT RO RU SD SE SG SI SK SZ TJ TM TR TT UA UG UZ VN

Title: Non-aging at room **temperature** ferritic single-phase **cold-rolled steel sheet** and **hot**-dip galvanized **steel sheet** for deep drawing having excellent fabrication embrittlement resistance and paint-bake hardenability and **process** for producing the same

Abstract: PCT No. PCT/JP93/01314 Sec. 371 Date Jun. 29, 1994 Sec. 102(e) Date Jun. 29, 1994 PCT Filed Sep. 14, 1993 PCT Pub. No. WO94/06948 PCT Pub. Date Mar. 31, 1994. The present invention provides a non-aging at room **temperature** ferritic single-phase **cold-rolled steel sheet** or **hot**-dip galvanized **steel sheet** for deep drawing and having excellent fabrication embrittlement resistance and paint-bake hardenability, by **heating** a **slab** comprising, in terms of percent by weight, 0.0001 to 0.0015 percent of C, not more than 1.2 percent of **Si**, 0.03 to 3.0 percent of **Mn**, 0.01 to 0.15 percent of P, 0.0010 to 0.020 percent of S, 0.005 to 0.1 percent of Al, 0.0001 to 0.0080 percent of N and 0.0001 to 0.0030 percent of B and optionally 0.1 to 3 percent of Cr with the balance consisting of Fe and unavoidable impurities, **hot-rolling** the **heated slab** at a finishing **temperature** of not lower than (Ar₃-100) DEG C., **cooling** the **hot-rolled coil** within 1 sec after the **hot rolling** at a rate of not less than 50 DEG C./sec from the finishing **temperature** to a **temperature** in the range of from 600 DEG to 750 DEG C. and **coiling** the **cooled** strip in said **temperature** range, **cold-rolling** the **coil** with a reduction ratio of not lower than 60 percent and conducting continuous **annealing** or continuous **hot-dip galvanizing** in the **temperature** range of from 600 DEG to 900 DEG C.

Classifications:

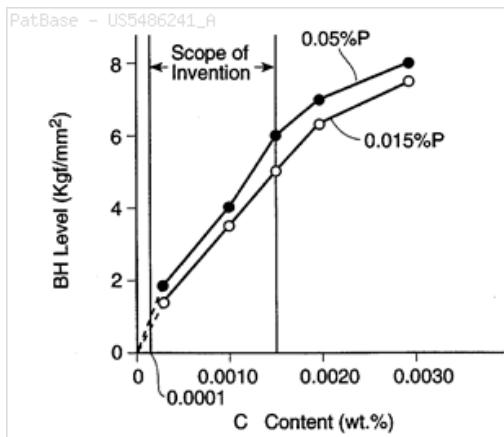
International (IPC 8-9): C21D8/04 C21D9/48 C22C38/00 C22C38/06 C22C38/32 C22C38/38 C23C2/02 C23C2/06 C23C2/28 (Advanced/Invention); C21D8/04 C21D9/48 C22C38/00 C22C38/06 C22C38/32 C22C38/38 C23C2/02 C23C2/06 C23C2/28 (Core/Invention)

International (IPC 1-7): C21D8/02 C21D8/04 C21D9/48 C22C38/00 C22C38/06 C22C38/32 C22C38/38 C23C2/06 C23C2/28

CPC: C21D8/0426 C21D8/0436 C21D8/0473 C21D2211/005 C22C38/32 C23C2/02

European: C21D8/04D2 C22C38/32 C23C2/02 M21D211/00F M21D8/04D6 M21D8/04F8

US: 148/330 148/603 148/651 148/661



Family:

Publication number	Publication date	Application number	Application date
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JP6212354 A2	19940802	JP19930007817	19930120
JP6271978 A2	19940927	JP19930060782	19930319
KR0128986 B1	19980416	KR19940071624	19940513
US5486241 A	19960123	US19940240782	19940629
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Priority:

JP19920245306 19920914 JP19920245307 19920914 JP19930007817 19930120
JP19930060782 19930319 WO1993JP01314 19930914

Probable Assignee: NIPPON STEEL CORP

Assignee(s): (std): AKISUE OSAMU ; MATSUMURA YOSHIKAZU ; MURAKAMI HIDEKUNI ; NIPPON STEEL CORP ; NISHIMURA KUNIO ; USHIODA KOHSAKU ; YOSHINAGA NAOKI

Assignee(s): SHINNIPPON SEITETSU KK ; NIPPON STEEL KK

Inventor(s): (std): AKISUE OSAMU ; MATSUMURA YOSHIKAZU ; MURAKAMI HIDEKUNI ; NISHIMURA KUNIO ; SHIODA KOSAKU ; USHIODA KOHSAKU ; YOSHINAGA NAOKI ; YOSHINAGA NAOKI NIPPON STEEL C ; USHIODA KOHSAKU NIPPON STEEL C ; NISHIMURA KUNIO NIPPON STEEL C ; MURAKAMI HIDEKUNI NIPPON STEEL ; MATSUMURA YOSHIKAZU NIPPON STE ; MATSUMURA GIICHI ; AKISUE OSAMU NIPPON STEEL CORP

Inventor(s): AKISUE OSAMU NIPPON STEEL CORPORATION ; MATSUMURA YOSHIKAZU NIPPON STEEL CORPORATION ; MURAKAMI HIDEKUNI NIPPON STEEL CORPORATION ; NISHIMURA KUNIO NIPPON STEEL CORPORATION ; USHIODA KOHSAKU NIPPON STEEL CORPORATION ; YOSHINAGA NAOKI NIPPON STEEL CORP ; YOSHINAGA NAOKI NIPPON STEEL CORPORATION ; USHIODA KOHSAKU NIPPON STEEL CORP ; NISHIMURA KUNIO NIPPON STEEL CORP ; MURAKAMI HIDEKUNI NIPPON STEEL CORP ; MATSUMURA YOSHIKAZU NIPPON STEEL CORP

Designated states: AT BE CH DE DK ES FR GB GR IE IT KR LU MC NL PT SE US

Title: **METHOD** FOR PRODUCING **GRAIN-ORIENTED** ELECTRICAL **STEEL SHEET**

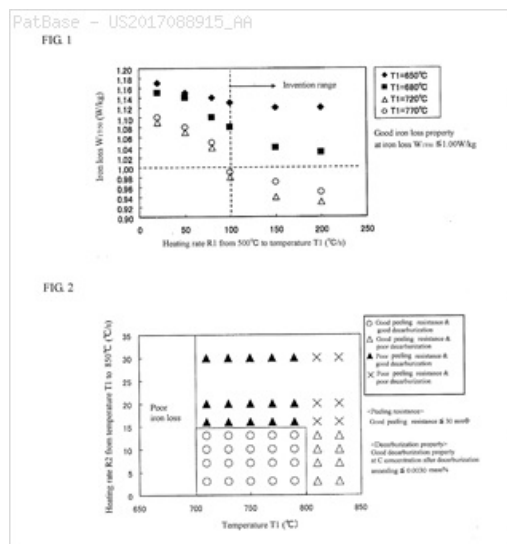
Abstract: A **method** for producing a **grain-oriented** electrical **steel sheet** by subjecting a **slab** of an inhibitor-less ingredient system containing C: 0.002-0.10 mass percent, **Si**: 2.5-6.0 mass percent, **Mn**: 0.010-0.8 mass percent and extremely decreased Al, N, Se and S to **hot rolling**, **hot band annealing**, **cold rolling**, decarburization **annealing**, application of an **annealing** separator and finish **annealing**, when a certain **temperature** within range of 700-800 degrees centigrade in a **heating process** of decarburization **annealing** is T1 and a certain **temperature** as a **soaking temperature** within a range of 820-900 degrees centigrade is T2, a **heating** rate R1 between 500 degrees centigrade and T1 is set to not less than 100 degrees centigrade /s and **heating** rate R2 between T1 and T2 is set to not more than 15 degrees centigrade /s, whereby **grain-oriented** electrical **steel sheet** having excellent iron loss property and coating peeling resistance is obtained in the inhibitor-less ingredient system while ensuring decarburization property even when rapid **heating** is performed during decarburization **annealing**.

Classifications:

International (IPC 8-9): C21D3/04 C21D8/12 C21D9/46 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/08 C22C38/12 C22C38/16 C22C38/32 C22C38/34 C22C38/60 H01F1/03 H01F1/16 H01F1/18 H01F41/02 (Advanced/Invention)

CPC: C22C38/00 H01F1/16 C21D8/1222 C21D8/1233 C21D8/1261 C21D8/1283 C22C38/02 C21D8/1266 C21D8/1255 C21D8/1272 C21D3/04 C22C38/34 C22C38/32 C22C38/16 C22C38/12 C22C38/08 C22C38/06 C22C38/04 C22C38/008 C22C38/002 C22C38/001 H01F41/0233 H01F1/0306 C21D9/46 C21D8/12 C22C38/60

US: 148/111



Family:

Publication number	Publication date	Application number	Application date
BR112016026549 A2	20170815	BR20161126549	20150511
CN106414780 A	20170215	CN201580024473	20150511
EP3144400 A1	20170322	EP20150793201	20150511
EP3144400 A4	20170517	EP20150793201	20150511
IN201637041930 A	20170505	IN201637041930	20161208
JP2015174361 A1	20170420	JP20150552310T	20150511
JP6057108 B1	20170111	JP20150552310T	20150511
KR20160142881 A	20161213	KR20167031304	20150511
US2017088915 AA	20170330	US20150310904	20150511
WO15174361 A1	20151119	WO2015JP63439	20150511

Priority:

JP20140098307 20140512 WO2015JP63439 20150511

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): JFE HOLDINGS INC ; JFE STEEL CORP ; KAWASAKI STEEL CO

Inventor(s): (std): SUEHIRO RYUICHI ; TAKAMIYA TOSHITO ; IMAMURA TAKESHI ; TERASHIMA TAKASHI ; WATANABE MAKOTO

Inventor(s): TOSHITO TAKAMIYA ; MAKOTO WATANABE ; RYUICHI SUEHIRO ; TAKASHI TERASHIMA ; TAKESHI IMAMURA

Agent(s): MARGUE ROBERT GERMAIN; GINZA MARONIE PC

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: **METHOD** FOR PRODUCING **GRAIN-ORIENTED** ELECTRICAL **STEEL SHEET**

Abstract: In a **method** for producing a **grain-oriented** electrical **steel sheet** by subjecting a **slab** containing C: 0.002-0.10 mass percent, **Si**: 2.5-6.0 mass percent, **Mn**: 0.01-0.8 mass percent and further containing Al and N, or S and/or Se, or Al, N, S and/or Se as inhibitor ingredients to **hot rolling**, **hot band annealing**, **cold rolling**, decarburization **annealing**, application of an **annealing** separator and finish **annealing**, when a certain **temperature** within a range of 700-800 degrees centigrade in a **heating process** of the decarburization **annealing** is T1 and a certain **temperature** as a **soaking temperature** within a range of 820-900 degrees centigrade is T2, a **heating** rate R1 between 500 degrees centigrade and T1 is set to not less than 80 degrees centigrade /s and a **heating** rate R2 between T1 and T2 is set to not more than 15 degrees centigrade /s, whereby a **grain-oriented** electrical **steel sheet** having excellent magnetic properties and peeling resistance of forsterite coating is obtained while ensuring decarburization property.

Classifications:

International (IPC 8-9): C21D3/04 C21D8/12 C21D9/46 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/08 C22C38/12 C22C38/16 C22C38/26 C22C38/34 C22C38/60 H01F1/147 H01F1/16 H01F3/02 (Advanced/Invention)

CPC: C22C38/00 C21D8/1283 C21D8/1222 C21D8/1233 C21D8/1261 C22C38/02 C22C38/04 C22C38/06 C21D8/1266 C21D8/1272 C21D3/04 C22C38/34 C22C38/26 C22C38/16 C22C38/12 C22C38/08 C22C38/008 C22C38/002 C22C38/001 H01F3/02 C21D9/46 C21D8/12 C22C38/60 H01F1/16

US: 148/111

PatBase - US2017081740_AA

FIG 1

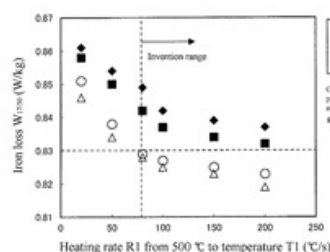
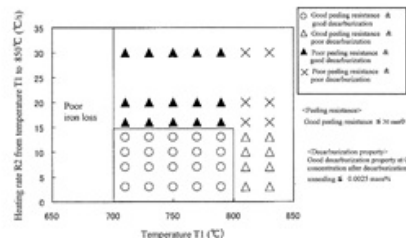


FIG 2



Family:

Publication number	Publication date	Application number	Application date
BR112016026571 A2	20170815	BR20161126571	20150511
CN106460085 A	20170222	CN201580024474	20150511
EP3144399 A1	20170322	EP20150792135	20150511
EP3144399 A4	20170510	EP20150792135	20150511
IN201637042164 A	20170505	IN201637042164	20161209
JP2015174362 A1	20170420	JP20150552311T	20150511
JP6103281 B1	20170329	JP20150552311T	20150511
KR20160138253 A	20161202	KR20167030086	20150511
US2017081740 AA	20170323	US20150311026	20150511
WO15174362 A1	20151119	WO2015JP63445	20150511

Priority:

JP20140098308 20140512 WO2015JP63445 20150511

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): JFE HOLDINGS INC ; JFE STEEL CORP ; KAWASAKI STEEL CO

Inventor(s): (std): SUEHIRO RYUICHI ; TAKAMIYA TOSHITO ; TERASHIMA TAKASHI ; WATANABE MAKOTO

Inventor(s): TOSHITO TAKAMIYA ; TAKASHI TERASHIMA ; MAKOTO WATANABE ; RYUICHI SUEHIRO

Agent(s): STEBBING TIMOTHY CHARLES; GINZA MARONIE PC

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: Method for manufacturing high magnetic flux density grain oriented electrical steel sheet based on low temperature slab heating method

Abstract: A method for manufacturing a high magnetic flux density grain oriented electrical steel sheet is disclosed. A silicon steel slab is heated and hot-rolled, and the steel sheet is annealed and cold-rolled and decarburized. An annealing separator is spread on the steel sheet, and a final high temperature annealing is carried out. The silicon steel contains in weight percent 0.02-0.045 percent of C, 2.90-3.30 percent of Si, 0.05-0.30 percent of Mn, 0.005-0.019 percent of Al, 0.003-0.008 percent of N, 0.006 percent or less of S (the above being main ingredients), 0.001-0.012 percent of B, and a balance of Fe and unavoidable impurities; or the above main ingredients plus 0.30-0.70 percent of Cu, 0.03-0.07 percent of Ni, 0.03-0.07 percent of Cr, and a balance of Fe and unavoidable impurities; or the above main ingredients plus 0.001-0.012 percent of B, 0.30-0.70 percent of Cu, 0.03-0.07 percent of Ni, 0.03-0.07 percent of Cr, and a balance of Fe and unavoidable impurities.

Classifications:

International (IPC 8-9): C21D1/26 C21D3/04 C21D8/12 C21D9/46 C22C38/00 C22C38/42 H01F1/16 (Advanced/Invention); C21D1/26 C21D3/00 C21D8/12 C21D9/46 C22C38/00 C22C38/42 H01F1/12 (Core/Invention)

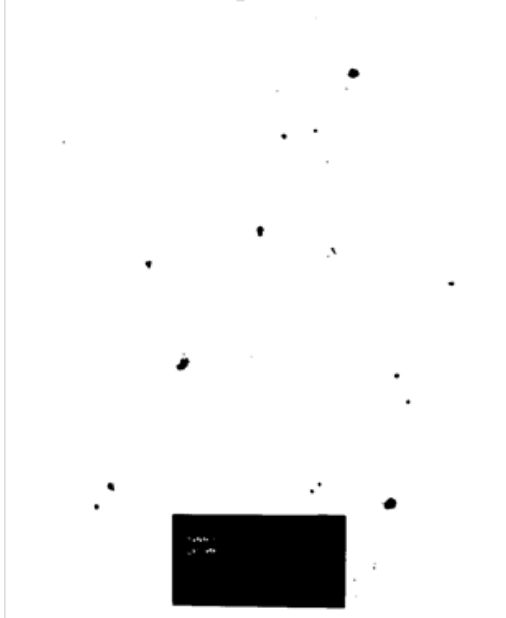
International (IPC 1-7): B21B1/38 B21B3/00 C21C7/068 C21D1/26 C21D8/12 C21D9/46 C22C38/00 C22C38/02 C22C38/42 H01F1/147 H01F1/16 H01F11/47

CPC: C21D3/04 C21D8/1255 C21D8/1272 C21D8/12

European: C21D3/04 C21D8/12F4 M21D8/12F8

US: 148/111 148/113

PatBase - KR19990015264_A



Family:

Publication number	Publication date	Application number	Application date
CN1088760 C	20020807	CN19988000888	19980626
CN1231001 A	19991006	CN19988000888	19980626
DE19881070 C2	20010222	DE19981081070	19980626
DE19881070 T	19990902	DE19981081070T	19980626
DE19881070 T1	19990902	DE19981081070T	19980626
JP2000503726 T2	20000328	JP19990508464T	19980626
JP3485188 B2	20040113	JP19990508464T	19980626
KR100340495 B1	20021122	KR19970028305	19970627
KR100345696 B1	20020918	KR19970037247	19970804
KR19990004252 A	19990115	KR19970028305	19970627
KR19990015264 A	19990305	KR19970037247	19970804
US6451128 BA	20020917	US19990242865	19990225
WO9902742 A2	19990121	WO1998KR00184	19980626
WO9902742 A3	19990401	WO1998KR00184	19980626

Priority:

KR19970028305 19970627 KR19970037247 19970804 WO1998KR00184 19980626

Probable Assignee: POHANG IRON AND STEEL CO LTD

Assignee(s): (std): CHOI GYU SEUNG ; HAN CHAN HYE ; LEE CHUNG SAN ; KIM JAE KWAN ; HONG BYUNG DEUK ; HAN KYU SEOK ; PO HANG IRON AND STEEL ; WOO JONG SOO ; POSCO

Assignee(s): POHANG IRON AND STEEL CO ; POHANG IRON AND STEEL CO LTD ; POHANG IRON AND STEEL CO LTD POHANG

Inventor(s): (std): CHAN HYE HAN ; CHUNG SAN LEE ; HAN CHAN HUI ; HONG BYEONG DEUK ; HYE HAN CHAN ; JONG SOO WOO ; HAN GYU SEOK ; KIM JAE GWAN ; LEE CHEONG SAN ; SAN LEE CHUNG ; SOO WOO JONG ; WOO JONG SU ; WOO JONG SOO ; LEE CHUNG SAN ; KIM JAE KWAN ; HONG BYUNG DEUK ; HAN KYU SEOK ; HAN CHAN HYE ; CHOI GYU SEUNG

Designated states: CN DE JP US

Title: **METHOD** OF PRODUCTION OF TIN CONTAINING NON **GRAIN-ORIENTED** SILICON **STEEL SHEET**, **STEEL SHEET** OBTAINED AND USE THEREOF

Abstract: A **method** of production non **grain-oriented** Fe-**Si steel sheet** is provided. The **method** includes the steps of **melting** a **steel** composition that contains in weight percentage: C?0.006, 2.0?Si?5.0, 0.1?Al?3.0, 0.1?Mn?3.0, N?0.006, 0.04?Sn?0.2, S?0.005, P?0.2, **Ti**?0.01, the balance being Fe and other inevitable impurities, **casting** said **melt** into a **slab**, reheating said **slab**, **hot rolling** said **slab**, **coiling** said **hot rolled steel**, optionally **annealing** the **hot rolled steel**, **cold rolling**, **annealing** and **cooling** the **cold rolled steel** down to room **temperature**.

Classifications:
International (IPC 8-9): C21D8/02 C21D8/12 C21D9/46 C21D9/56 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/14 C22C38/38 C22C38/58 C22C38/60 H01F1/147 H01F1/16 H02K1/02 (Advanced/Invention)
International (IPC 1-7): C21D8/12 C22C38/00 C22C38/06 C22C38/38 H01F1/16
CPC: C21D8/12 C22C38/00 C22C38/38 H01F1/16 C21D9/56 C22C38/004 C22C38/02 C22C38/04 C22C38/60 C21D8/1222 C22C38/14 C22C38/008 C22C38/001 C21D8/1272 C21D8/1233 C21D8/1244 C21D9/46 C21D2211/005 C22C38/06

Family:

Publication number	Publication date	Application number	Application date
BR112017008193 A2	20171226	BR20171108193	20151020
CA2964681 AA	20170413	CA20152964681	20151020
CL2017000958 A1	20180223	CL20170000958	20170418
CN107075647 A	20170818	CN201580057132	20151020
CO20170003825 A2	20170831	CO20170003825	20170420
CR20170156 A	20170922	CR20170000156	20141020
CU20170054 A7	20171005	CU20170000054	20151020
DOP2017000099 A	20170815	DO20170000099	20170419
EP3209807 A1	20170830	EP20150802190	20151020
IN201717013441 A	20170804	IN201717013441	20170415
JP2017537230 T2	20171214	JP20170540331T	20151020
KR20170072210 A	20170626	KR20177010550	20151020
MX2017005096 A1	20180223	MX20170005096	20151020
PE12482017 A1	20170828	PE20170000725	20151020
SV2017005423 A	20171017	SV20170005423	20170420
US2017314087 AA	20171102	US20150520243	20151020
WO16063098 A1	20160428	WO2014IB02174	20141020
WO16063118 A1	20160428	WO2015IB01944	20151020

Priority:
WO2014IB02174 20141020 WO2015IB01944 20151020

Probable Assignee: ARCELORMITTAL

Assignee(s): (std): ARCELORMITTAL CO LTD ; ARCELORMITTAL

Assignee(s): ARCELORMITTAL CO ; JACOBS SIGRID ; LEUNIS ELKE ; SAIKALY WAHIB ; VAN DE PUTTE TOM

Inventor(s): (std): DE PUTTE TOM VAN ; ELKE LEUNIS ; JACOBS SIGRID ; LEUNIS ELKE ; SAIKALY WAHIB ; SIGRID JACOBS ; VAN DE PUTTE TOM ; TOM VAN DE PUTTE ; WAHIB SAIKALY

Agent(s): SMART AND BIGGAR; JOSE ANDRES RINCON USCATEGUI; LAVOIX; KAWAGUTI AND PARTNERS; PLAISANT SOPHIE

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: THIN **STEEL SHEET** AND **PROCESS** FOR PRODUCING THE SAME

Abstract: A thin **steel sheet** having **sheet** thickness ≥ 1.6 mm, but tensile strength ≥ 780 MPa and Young's modulus ≥ 240 GPa in transverse direction is provided, where the **steel sheet** has composition including, in mass percent, C: 0.06-0.12 percent, **Si**: 0.5-1.5 percent, **Mn**: 1.0-3.0 percent, P: 0.05 percent or less, S: 0.01 percent or less, Al: 0.5 percent or less, N: 0.01 percent or less, **Ti**: 0.02-0.20 percent, and the balance being Fe and incidental impurities, where the composition satisfies relations of Formula (1) and (2), and microstructure such that ferrite phase has area ratio ≥ 60 percent and martensite phase has area ratio of 15-35 percent, ferrite and martensite phases are 95 percent or more in total, average **grain size** of ferrite is ≥ 4.0 micro m and that of martensite is ≥ 1.5 micro m, $0.05[\text{percent C}] - (12/47.9) \times [\text{percent Ti}]$ (1), where $\text{Tiss} = [\text{percent Ti}] - (47.9/14) \times [\text{percent N}] - (47.9/32.1) \times [\text{percent S}]$ (2).

Classifications:

International (IPC 8-9): B21B3/00 C21D8/02 C21D8/04 C21D9/46 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/08 C22C38/12 C22C38/14 C22C38/16 C22C38/28 C22C38/38 C22C38/58 (Advanced/Invention); B21B3/00 C21D9/46 C22C38/00 (Core/Invention)

CPC: C22C38/00 C21D8/0436 C21D8/0463 C21D8/0473 C21D2211/004 C21D8/0263 C22C38/38 C22C38/28 C22C38/16 C22C38/08 C22C38/002 C21D2211/005 C21D2211/008 C22C38/001 C22C38/02 C22C38/06 C22C38/12 C22C38/14 C21D9/46 C22C38/04

US: 148/330 148/333 148/337 148/507

Family:

Publication number	Publication date	Application number	Application date
CN103930585 A	20140716	CN201280055523	20121107
CN103930585 B	20150722	CN201280055523	20121107
EP2781615 A1	20140924	EP20120850214	20121107
EP2781615 A4	20150701	EP20120850214	20121107
IN00387KN2014 A	20140418	IN2014KN00387	20140221
JP2013073136 A1	20150402	JP20130524300T	20121107
JP5370620 B1	20131218	JP20130524300T	20121107
KR20140048348 A	20140423	KR20147008893	20121107
TH134427 A	20140606	TH20121005912	20121113
US2015027594 AA	20150129	US20120355756	20121107
WO13073136 A1	20130523	WO2012JP07147	20121107

Priority:

JP20110250015 20111115 JP20130524300 20121107 WO2012JP07147 20121107

Probable Assignee: JFE HOLDINGS INC

Assignee(s): (std): JFE HOLDINGS INC ; JFE STEEL CORP ; KAWASAKI STEEL CO

Inventor(s): (std): KAWAMURA KENJI ; YOKOTA TAKESHI

Agent(s): GRUENECKER KINKELDEY STOCKMAIR AND SCHWANHAUESSER; SUGIMURA KENJI

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: **Method** of producing non-**oriented** electrical **steel sheet** having good magnetic properties

Abstract: A **method** of producing non-**oriented** electrical **steel sheet** comprising the steps of preparing **steel** comprising, by weight, up to 2.5 percent silicon, up to 1.0 percent aluminum and up to 2.5 percent (**Si**+2Al), with the remainder being iron and unavoidable impurities, **hot rolling** and **cold rolling** the **steel** to a final thickness and following this by finish **annealing**, wherein the average **cooling** rate between Ar3 and Ar1 during **cooling** transformation (gamma -> alpha) of the **steel** is controlled to be 50 DEG C./s or less.

Classifications:

International (IPC 8-9): B22D11/00 B22D11/06 C21D8/12 C22C38/00 C22C38/06 H01F1/147 H01F1/16 (Advanced/Invention); B22D11/00 B22D11/06 C21D8/12 C22C38/00 C22C38/06 H01F1/12 (Core/Invention)

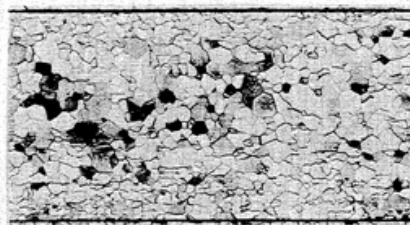
International (IPC 1-7): B22D11/00 B22D11/06 C21D8/12 C22C38/00 C22C38/06 H01F1/147 H01F1/16

CPC: C21D8/1205 C21D8/1222 C21D8/1244 C21D8/1266 H01F1/14775

European: C21D8/12F H01F1/147S1 M21D8/12B M21D8/12D2 M21D8/12F7

US: 148/111 148/120

PatBase - US5421912_A



Family:

Publication number	Publication date	Application number	Application date
AT186333 E	19991115	AT19920113814T	19920813
DE69230239 D1	19991209	DE19926030239	19920813
DE69230239 T2	20000413	DE19926030239T	19920813
EP0527495 A1	19930217	EP19920113814	19920813
EP0527495 B1	19991103	EP19920113814	19920813
JP2103127 C3	19961022	JP19910204419	19910814
JP2103128 C3	19961022	JP19910204420	19910814
JP2515449 B2	19960710	JP19910204421	19910814
JP5043937 A2	19930223	JP19910204419	19910814
JP6336609 A2	19941206	JP19910204420	19910814
JP7173538 A2	19950711	JP19910204421	19910814
JP8011809 B4	19960207	JP19910204419	19910814
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KR19930004481 A	19930322	KR19920014546	19920813
KR960011799 B1	19960830	KR19920014546	19920813
US5421912 A	19950606	US19940213999	19940315

Priority:

JP19910204419 19910814 JP19910204420 19910814 JP19910204421 19910814
US19920929516 19920814 US19940213999 19940315

Probable Assignee: NIPPON STEEL CORP

Assignee(s): (std): NIPPON STEEL CORP

Assignee(s): NIPPON STEEL CORP TOKIO TOKYO ; NIPPON STEEL K K ; NIPPON STEEL KK ; SHINNIPPON SEITETSU KK

Inventor(s): (std): HIROAKI MASUI ; OHAZA SHIMATA ; TADASHI NAKAYAMA ; TAKESHI KUBOTA ; TOMOJI KUMANO ; YUJI YOSHIMURA ; YOSHIMURA YUJI ; NAKAYAMA TADASHI ; MASUI HIROAKI ; KUMANO TOMOJI ; KUBOTA TAKESHI

Designated states: AT DE FR GB IT SE

Title: MANUFACTURE **PROCESS** OF NON-**ORIENTED** SILICON **STEEL** WITH HIGH MAGNETIC INDUCTION

Abstract: A manufacture **process** of non-**oriented** silicon **steel** with high magnetic induction includes smelting and **casting steel** having a chemical composition by weight percent: **Si** 0.1~1 percent, Al 0.005~1.0 percent, C 0.004 percent, **Mn** 0.10~1.50 percent, P 0.2 percent, S 0.005 percent, N 0.002, Nb+V+**Ti** 0.006 percent, and the rest is Fe. The **steel** is **cast** into a billet, which is **heated** and **hot-rolled** to 1150~1200 degrees centigrade into a **plate** at a finish-**rolling temperature** 830~900 degrees centigrade. The **plate** is **cooled** to a **temperature** 2570 degrees centigrade and **cold-roll** flattened at compression ratio 2~5 percent. The flattened **plate** is normalized at **temperature** not below 950 degrees centigrade for 30~180s, and then pickled and **cold-rolled** into a **sheet** with thickness of the finished product. The **sheet** is finish-**annealed** quickly **heating** the **sheet** to 800~1000 degrees centigrade at **temperature** rise rate 100 degrees centigrade /s, **soaking** the **heated sheet** for 5~60s at the **temperature**, and then slowly **cooling** the **sheet** to 600~750 degrees centigrade.

Classifications:

International (IPC 8-9): B21B1/00 B22D11/00 C21C5/00 C21D1/00 C21D6/00 C21D8/00 C21D8/12 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/12 C22C38/14 C22C38/34 C22C38/40 H01F1/16 (Advanced/Invention)

CPC: C21D6/008 C21D8/00 C22C38/001 C22C38/002 C22C38/004 C22C38/04 C22C38/12 C22C38/14 H01F1/16 C22C38/00 C22C38/02 C22C38/06 C21D1/00

European: C22C38/00 C22C38/02 C22C38/06

US: 148/546

PatBase - US2012285584_AA

Patent Application Publication

Nov. 15, 2012

US 2012/0285584 A1

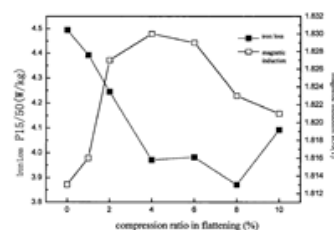


Fig. 1

Family:

Publication number	Publication date	Application number	Application date
CN102453837 A	20120516	CN201010517872	20101025
CN102453837 B	20130717	CN201010517872	20101025
EP2508629 A1	20121010	EP20110835489	20110414
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RU2527827 C2	20140910	RU20120124187	20110414
US2012285584 AA	20121115	US20120492984	20120611
WO12055215 A1	20120503	WO2011CN072775	20110414

Priority:

CN201010517872 20101025 WO2011CN072775 20110414

Probable Assignee: BAOSTEEL GROUP CORP

Assignee(s): (std): CHEN XIAO ; HU ZHANYUAN ; MA AIHUA ; XIE SHISHU ; WANG ZITAO ; JIN BINGZHONG ; ZHU YUHUA ; ZOU LIANG ; WANG BO ; BAOSHAN IRON AND STEEL ; BAOSHAN IRON AND STEEL CO LTD

Assignee(s): BAOSTEEL GROUP CORP ; BAOSHAN IRON AND STEEL CO

Inventor(s): (std): AIHUA MA ; BINGZHONG JIN ; BO WANG ; CHEN XIAO ; HU ZHANYUAN ; JIN BINGZHONG ; LIANG ZOU ; MA AIHUA ; SHISHU XIE ; WANG BO ; WANG ZITAO ; XIAO CHEN ; XIE SHISHU ; YUHUA ZHU ; ZHANYUAN HU ; ZHU YUHUA ; ZITAO WANG ; ZOU LIANG

Agent(s): JENNINGS NIGEL ROBIN; FUKAMI PATENT OFFICE PC; SHANGHAI PATENT AND TRADEMARK LAW OFFICE LLC

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: High-strength cold-rolled steel sheet having high r value and process for manufacturing the same

Abstract: A heat-treatment-hardenable cold-rolled steel sheet having a high r value, comprising 0.010 percent or less of carbon, 0.05 to 0.5 percent of manganese, 1.0 percent or less of silicon, 0.001 to 0.030 percent of sulfur, 0.03 percent or less of phosphorus, 0.0050 percent or less of nitrogen, 0.005 to 0.10 percent of sol. aluminum, and 0.8 to 2.2 percent of copper with the balance being iron and unavoidable elements and, optionally incorporated therein, either or both of titanium and niobium and further nickel and optionally boron. The steel sheet can be manufactured by subjecting a cold-rolled steel sheet having this composition to recrystallization annealing at a temperature of 750 degrees C. or above and then heat-treating the steel sheet at a temperature ranging from 450 degrees to 700 degrees C. for 1 minute or longer. Alternatively, after the recrystallization annealing, the sheet can be cooled to a temperature of 450 degrees C. or below within 1 minute, followed by work deformation and heat-treating the work-deformed product at a temperature of 450 degrees C. or above to increase the strength of the steel sheet.

Classifications:

International (IPC 8-9): C21D8/04 C21D9/46 C21D9/52 C21D9/56 C22C38/00 C22C38/16 (Advanced/Invention)

International (IPC 1-7): C21D8/04 C21D9/46 C21D9/52 C21D9/56 C22C38/00 C22C38/16

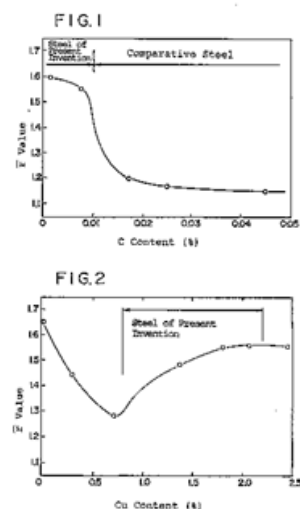
CPC: C22C38/16

European: C22C38/16

US: 148/332 148/603 9

PatBase - US4961793_R

U.S. Patent Oct. 9, 1990 Sheet 1 of 2 4,961,793



Family:

Publication number	Publication date	Application number	Application date
DE3880276 D1	19930519	DE19883880276	19880627
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EP0319590 A1	19890614	EP19880906042	19880627
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EP0319590 B1	19930414	EP19880906042	19880627
JP1004429 A2	19890109	JP19870157892	19870626
JP1690366 C3	19920827	JP19870157892	19870626
JP2015609 B4	19900412	JP19870157892	19870626
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US4961793 A	19901009	US19880320268	19881118
WO8810319 A1	19881229	WO1988JP00640	19880627

Priority:

JP19870157892 19870626 WO1988JP00640 19880627

Probable Assignee: NIPPON STEEL CORP

Assignee(s): (std): NIPPON STEEL CORP

Assignee(s): NIPPON STEEL CORP TOKIO TOKYO JP

Inventor(s): (std): AKISUE NIPPON STEEL CORP ; AKISUE OSAMU ; AKISUE OSAMU NIPPON STEEL CORP ; KISHIDA KOJI ; KISHIDA KOJI NIPPON STEEL CORP ; KISHIDA NIPPON STEEL CORP

Inventor(s): KISHIDA KOJI NIPPON STEEL CORPORATION ; AKISUE OSAMU NIPPON STEEL CORPORATION

Designated states: DE FR GB US

Title: A **METHOD** FOR PRODUCING A HIGH STRENGTH STRIP **STEEL** WITH A GOOD DEEP DRAWABILITY AND A HIGH STRENGTH **STEEL** PRODUCED THEREBY

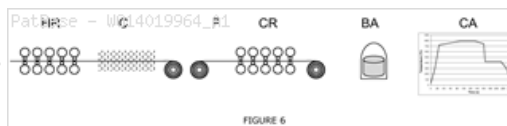
Abstract: This invention relates to a **method** for producing a high strength strip **steel** with a good deep drawability and a high strength **steel** produced thereby.

Classifications:

International (IPC 8-9): B32B15/01 C21D1/20 C21D8/02 C21D8/04 C21D9/48 C21D9/56 C22C38/00 C22C38/02 C22C38/04 C22C38/06 C22C38/18 C22C38/58 (Advanced/Invention)

CPC: C21D9/48 C22C38/001 C22C38/02 C22C38/04 C22C38/06 C22C38/18 B32B15/013 C22C38/58 C21D1/20 C21D8/0436

C21D8/0447 C21D8/0473 C21D9/56 C21D2211/001 C21D2211/002 C21D2211/005 C21D2211/008



Family:

Publication number	Publication date	Application number	Application date
DE602013019181 D1	20170511	DE201360019181T	20130726
EP2880192 A1	20150610	EP20130744491	20130726
EP2880192 B1	20170329	EP20130744491	20130726
ES2623834 T3	20170712	ES20130744491T	20130726
IN01030CN2015 A	20160701	IN2015CN01030	20150223
WO14019964 A1	20140206	WO2013EP65847	20130726

Priority:

EP20120178555 20120730 EP20120178584 20120731 WO2013EP65847 20130726
EP20130744491 20130726

Probable Assignee: TATA STEEL NEDERLAND TECH BV

Assignee(s): (std): TATA STEEL NEDERLAND TECH BV ; TATA STEEL NEDERLAND TECHNOLOGY BV

Inventor(s): (std): LIU CHENG

Agent(s): BODIN ANDRE; SAEZ ANA

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: **METHOD** FOR PRODUCING A **GRAIN-ORIENTED** ELECTRICAL **STEEL SHEET** PRODUCT INTENDED FOR ELECTRICAL ENGINEERING APPLICATIONS

Abstract: In the course of the **method** of the invention for producing a **grain-oriented** electrical **steel sheet** product intended for electrical engineering applications, a **cold-rolled** strip with a final thickness of 0.15 to 0.5 mm is first **rolled** from a **hot-rolled** strip that contains, in addition to iron and unavoidable impurities, (in weight percent): 2.5 - 4.0 percent **Si**, 0.02 - 0.1 percent C, 0.01 - 0.065 percent Al, 0.003 - 0.015 percent N, optionally up to 0.30 percent **Mn**, up to 0.05 percent **Ti**, up to 0.3 percent P, one or more elements from the group consisting of S, Se in contents whose sum is at most 0.04 percent, one or more elements from the group consisting of As, Sn, Sb, Te, Bi with contents of up to 0.2 percent each, one or more elements from the group consisting of Cu, Ni, Cr, Co, Mo with contents of up to 0.5 percent each and one or more elements from the group consisting of B, V, Nb with contents of up to 0.012 percent each. Said strip then undergoes decarburization **annealing**. An oxide layer forms on the **cold-rolled** strip in the **process**. According to the invention, the oxide layer is removed before the **cold-rolled** strip undergoes nitriding **annealing** in an atmosphere containing NH₃ at a partial pressure ratio PH₂O/PH₂ = 0.1. After application of an **annealing** separator, the **cold-rolled** strip is finally **annealed** to form a Goss texture.

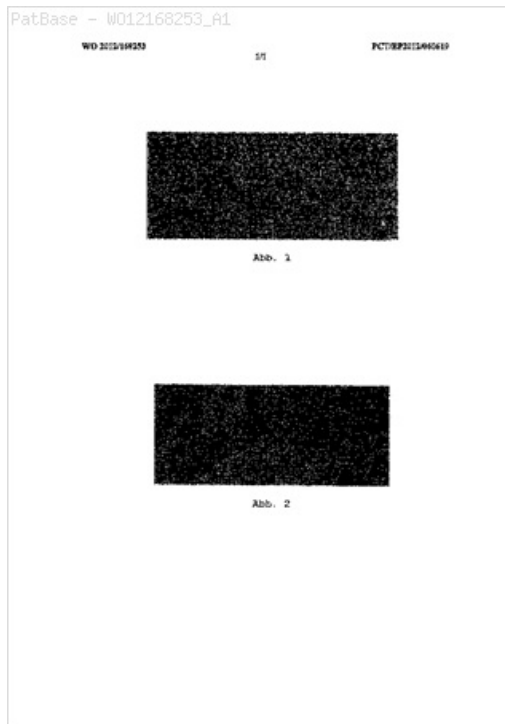
Classifications:

International (IPC 8-9): C21D8/12 C22C38/02

C22C38/04 (Advanced/Invention)

CPC: C21D8/1255 C21D8/1283 C22C38/02

European: C21D8/12F4 C22C38/02 M21D8/12H2



Family:

Publication number	Publication date	Application number	Application date
DE102011119395 A1	20121206	DE201110119395	20110606
WO12168253 A1	20121213	WO2012EP60619	20120605

Priority:

DE201110119395 20110606

Probable Assignee: THYSSENKRUPP ELECTRICAL STEEL GMBH

Assignee(s): (std): DUMAN EYUP ; KRENKE THORSTEN ; LAHN LUDGER ; THYSSENKRUPP ELECTRICAL STEEL GMBH

Inventor(s): (std): LAHN LUDGER ; KRENKE THORSTEN ; DUMAN EYUP

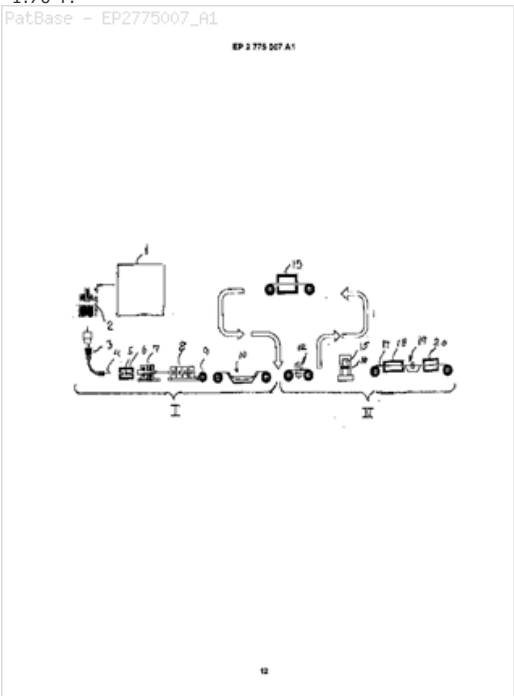
Agent(s): COHAUSZ AND FLORACK

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: A **PROCESS** FOR THE PRODUCTION OF A **GRAIN-ORIENTED** ELECTRICAL **STEEL** PROCEDE DE PRODUCTION D'UN ACIER ELECTRIQUE A **GRAINS ORIENTES** </TI_FR

Abstract: The invention relates to a **process** for the production of **grain oriented** electrical **steel** by providing a **hot rolled** strip having a carbon content of less than 0.006 weight percent, subjecting said strip to **cold rolling**, intermediate **annealing**, **cold rolling** to final thickness and thereafter subjecting the **cold rolled** strip to a batch **annealing** and a final continuous **annealing** in order to produce a final product having a maximum core loss at 1.7 T and 50 Hz (P 17/50) of < 2 W/kg and/or a minimum magnetic flux density at 800 A/m (J 800) of> 1.70 T.

Classifications:
International (IPC 8-9): C21D8/12 C21D9/46 C22C38/02 C22C38/04 C22C38/60 (Advanced/Invention)
CPC: C21D9/46 C22C38/04 C22C38/60 C21D8/12 C22C38/02 C22C38/001 C22C38/004 C22C38/008 C22C38/06 C22C38/16



Family:

Publication number	Publication date	Application number	Application date
EP2775007 A1	20140910	EP20130158409	20130308

Priority:

EP20130158409 20130308

Probable Assignee: VOESTALPINE STAHL GMBH

Assignee(s): (std): VOESTALPINE STAHL GMBH

Inventor(s): (std): ALBINI LUCIANO ; CICALI STEFANO ; KREUZER HERBERT

Agent(s): JOHANSSON LARS E

Designated states: AL AT BA BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR