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Application Number: 17319306 Document Date: 05/13/2021

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Form Revision Date: March 1, 2019

Amendments to the Specification and Abstract

Please amend the specification as follows:

[0000.1] This is a Continuation of U.S. Patent Application No. 16/413,799 filed May 16, 2019, which is a Continuation of U.S. Patent Application No. 15/606,770 filed May 26, 2017 which is a Continuation of U.S. Patent Application No. 13/621,015, filed September 15, 2012, now U.S. Patent 9,708,683, which is a Divisional of U.S. Patent Application No. 12/447,777, filed April 29, 2009, now U.S. Patent No. 8,307,680, which is a National Phase Application of International Patent Application PCT/IB06/004019, filed October 30, 2006. All of the above patent applications are hereby incorporated by reference herein.

No new matter has been added.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Application of:	ARCELORMITTAL
Inventor(s):	Drillet et al.
Application No.:	TBA
Filed:	HEREWITH
Attorney Docket No.:	20631.1028CON7
Confirmation No.:	
Title:	Coated Steel Strips, Coated Stamped Products and Methods

Submitted electronically via EFS-Web May 13, 2021

Mail Stop:

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Dear Madam or Sir:

Applicant requests that the following amendments be made in the above-identified matter prior to examination thereof:

Amendments to the Claims:

The following listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1-24 (canceled).

Claim 25 (New) A hot stamped coated steel product, which comprises:

(a) a strip of base steel having a first side and a second side; and

(b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel, wherein:

(i) said coating results from interdiffusion between said base steel and an aluminum or aluminum alloy pre-coating, and

(ii) wherein said coating comprises, proceeding from the base steel outwards:

(a) an Interdiffusion layer,

(b) an Intermediate layer,

(c) an Intermetallic layer, and

(d) a Superficial layer,

wherein layers (a), (b), (c), and (d) each have a different mean composition from one another,

wherein said coating of the hot stamped coated steel product has a thickness greater than 30 micrometers.

Claim 26 (New) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 27 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has an HV50g hardness between 290 and 410; layer (b) has an HV50g hardness between 900 and 1000, +/-10%; layer (c) has an HV50g hardness between 580 and 650, +/-10%; and layer (d) has an HV50g harness between 900 and 1000, +/-10%.

Claim 28 (New) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 17 micrometers or less.

Claim 29 (New) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 15 micrometers or less.

Claim 30 (New) The hot stamped coated steel product according to claim 28, wherein the coating is 40 micrometers thick.

Claim 31 (New) The hot stamped coated steel product according to claim 25, wherein the interdiffusion layer has a first mean iron composition, the intermediate layer has a second mean iron composition less than the first mean iron composition; wherein the intermetallic layer has a third mean iron composition, the third mean iron composition less than the first mean iron composition and greater than the second mean iron composition, and the superficial layer has a fourth mean iron composition, the fourth mean iron composition begin less than the third mean iron composition.

Claim 32 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (b).

Claim 33 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (c).

Claim 34 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (d).

Claim 35 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness: that is greater than a thickness of layer (b); that is greater than a thickness of layer (c); and that is greater than a thickness of layer (d).

Claim 36 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (b).

Claim 37 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (c).

Claim 38 (New) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (d).

Claim 39 (New) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product is fully martensitic.

Claim 40 (New) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:
0.15%<carbon<0.5%;
0.5%<manganese<3%;
0.1%<silicon<0.5%;
0.01%<chromium<1%;
titanium<0.2%;
aluminum<0.1%;
phosphorus<0.1%;
sulfur<0.05%;
0.0005%<boron<0.08%;
a remainder being iron and impurities inherent in processing.

Claim 41 (New) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:
0.15%<carbon<0.25%,
0.8%<manganese<1.8%,
0.1%<silicon<0.35%,
0.01%<chromium<0.5%,

titanium<0.1%
aluminum<0.1%
phosphorus<0.1%
sulfur<0.05%
0.002%<boron<0.005%,
a remainder being iron and impurities inherent in processing.

Claim 42 (New) The hot stamped coated steel product according to claim 25, wherein the Interdiffusion layer comprises the following components by weight based on total weight: 86 to 95% Fe, 4 to10% Al, and 0 to 5% Si.

Claim 43 (New) The hot stamped coated steel product according to claim 42, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 44 (New) The hot stamped coated steel product according to claim 43, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 45 (New) The hot stamped coated steel product according to claim 44, wherein the Superficial layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53to 61% Al, and 0 to 2% Si, and wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 46 (New) The hot stamped coated steel product according to claim 25, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 47 (New) The hot stamped coated steel product according to claim 46, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 48 (New) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1000 MPa.

Claim 49 (New) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1500 MPa.

Claim 50 (New) A method of forming a hot stamped coated steel product, comprising:

providing a precoated steel strip, the precoated steel strip including a base steel having a first side and a second side, and a precoating on at least one of the first side and the second side, the precoating being made of aluminum or an aluminum alloy;

heating the precoated steel strip for 3 to 13 minutes in a furnace pre-heated to between 880° C and 940 ° C, wherein the precoated strip experiences a temperature rise at a heating rate (Vc) between 4° and 12° C./s, wherein Vc is a mean heating rate between 20 and 700 C;

removing the heated precoated steel strip from the furnace; and then

hot stamping the precoated strip to deform the precoated steel strip into a hot stamped coated steel product, the hot stamped coated steel product having a coating comprising, proceeding from the base steel outwards:

(a) an Interdiffusion layer,

(b) an Intermediate layer,

(c) an Intermetallic layer, and (d) a Superficial layer,

wherein layers (a), (b), (c), and (d) each have a different mean composition from one another,

wherein the coating on the hot stamped coated steel product has a thickness greater than 30 micrometers.

Claim 51 (New) The method according to claim 50, further comprising cooling at a rate of more than 30° C./s, wherein the cooling rate is defined the mean rate between the exit of the heated blank from the furnace, down to 400° C.

Claim 52 (New) The method according to claim 51, wherein an elapsed time between said removing of the heated precoated strip from the furnace and said hot stamping is less than 10 seconds.

Claim 53 (New) The method according to claim 51, wherein the hot stamping includes hot stamping at a strain higher than 10% and wherein the cooling is cooling at a rate higher than 50° C./s to form a fully martensitic hot stamped coated steel product.

Claim 54 (New) The method according to claim 53, wherein an elapsed time between said removing of the heated precoated strip from the furnace and said hot stamping is less than 10 seconds.

REMARKS

Claims 1-24 are canceled. Claim 25-54 are added. The specification has been amended. No new matter has been added.

In the event of a fee discrepancy, please charge our Deposit Account No. 50-0552.

Reconsideration and allowance of the present application is respectfully requested.

Respectfully submitted,
DAVIDSON, DAVIDSON & KAPPEL, LLC

By /Cary Kappel /
Cary Kappel
(Reg. No. 36,561)

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Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/SB/424 (12-11)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Drillet	Nonprovisional Application Number (if known):	
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid.

2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed oath or declaration under 37 CFR 1.63 is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /williamcgehris/	Date 05/10/2021
Name (Print/Typed) William C. Gehris	Practitioner Registration Number 38156

Note: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below.*

☐ *Total of _____ forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE

This Power of Attorney is submitted by:

Submitter Name: **ArcelorMittal**

Address: **24-26 Boulevard d'Avranches**
1160 Luxembourg
LUXEMBOURG

The Submitter hereby appoints the practitioners at **Davidson, Davidson & Kappel, LLC** associated with the Customer Number:

23280

as its attorney(s) or agent(s) to represent the Submitter before the United States Patent and Trademark Office (USPTO) and to transact all business before the USPTO in connection with any and all applications of which the Submitter is the/an applicant and the/an assignee or entity to whom the inventor(s) is/are obligated to assign.

Please direct all correspondence for any and all applications in which this Power of Attorney is submitted to the address associated with the Customer Number:

23280

The individual(s) whose name(s) and title(s) is/are supplied below is/are authorized to act on behalf of the Submitter.

Date: March 3, 2016

By _____
Name: **Sophie Plaisant**
Title: **Head of Central Patent Team**
Corporate Officer

Date: _____

By _____
Name:
Title:

Doc code: Oath
Document Description: Oath or declaration filed

PTO/AIA/02 (07-13)
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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 15/606,770 filed on May 26, 2017

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Dominique Spehner

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Balan		FR

Mailing Address (except for a deceased or legally incapacitated inventor):

8 rue de la Porte

City	State	Zip	Country
Balan		08200	FR

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
- ☐ Inventor is under legal incapacity,
- ■ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ■ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Sophie Plaisant

Date (Optional): 24 July 2018

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: ARCELORMITTAL

Title of Person Executing This Substitute Statement: Head of Central Patent Team, Corporate Officer

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City	State	Country
Montreuil		France

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

City	State	Zip	Country

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ASSIGNMENT AND DECLARATION UNDER 37 C.F.R. § 1.63

(For Use with Signed Application Data Sheet)

Title of Invention: COATED STEEL STRIPS, COATED STAMPED PRODUCTS AND METHODS

Attorney Docket No.: 20631.1028CON

This assignment and declaration are directed to (check one):

- ☐ the attached application;
- ☐ the application identified by the attorney docket no. and title of invention given above;
- ☒ United States Application or PCT International Application No. **15/606,770**, filed **May 26, 2017**.

ASSIGNMENT

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, as a below-named inventor I have sold and assigned, and hereby sell and assign, to:

Name of Assignee: ARCELORMITTAL

Address of Assignee: 24-26 Blvd d'Avranches L-1160 Luxembourg, Luxembourg

(hereinafter ASSIGNEE) all right, title, and interest in and to the above-identified invention and United States patent application, including : (i) any and all divisions or continuations thereof, and in and to any and all Letters Patent of the United States that may issue on any such application or for said invention, including any and all reissues or extensions thereof, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such Letters Patent may be granted; (ii) all applications for patents, utility models, and designs which may hereafter be filed for said invention in any country or countries foreign to the United States, together with the right to file such applications and the right to claim for the same the priority rights derived from said United States application under the Patent Laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such patents, utility models, designs or other rights may be granted; and (iii) all forms of industrial property protection, including, without limitation, patents, utility models, inventors' certificates and designs which may be granted for said invention in any country or countries foreign to the United States and all extensions, renewals and reissues thereof, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such patents, utility models, designs or other rights may be granted.

I hereby authorize and request the Director of the U.S. Patent and Trademark Office to issue any and all such Letters Patent to said ASSIGNEE, its successors, or assigns in accordance herewith.

I warrant and covenant that I have the right to sell and assign the interests herein sold and assigned and that I have not executed and will not execute any document or instrument in conflict herewith.

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DECLARATION

As a below-named inventor, I hereby declare that:

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. § 1001 by fine or imprisonment of not more than five (5) years, or both.

Signature: _____

Inventor: **Pascal DRILLET** Date: 21/06/2017

ASSIGNMENT AND DECLARATION UNDER 37 C.F.R. § 1.63

(For Use with Signed Application Data Sheet)

Title of Invention: COATED STEEL STRIPS, COATED STAMPED PRODUCTS AND METHODS

Attorney Docket No.: 20631.1028CON

This assignment and declaration are directed to (check one):

- ☐ the attached application;
- ☐ the application identified by the attorney docket no. and title of invention given above;
- ☒ United States Application or PCT International Application No. **15/606,770**, filed **May 26, 2017**.

ASSIGNMENT

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, as a below-named inventor I have sold and assigned, and hereby sell and assign, to:

Name of Assignee: ARCELORMITTAL

Address of Assignee: 24-26 Blvd d'Avranches L-1160 Luxembourg, Luxembourg

(hereinafter ASSIGNEE) all right, title, and interest in and to the above-identified invention and United States patent application, including : (i) any and all divisions or continuations thereof, and in and to any and all Letters Patent of the United States that may issue on any such application or for said invention, including any and all reissues or extensions thereof, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such Letters Patent may be granted; (ii) all applications for patents, utility models, and designs which may hereafter be filed for said invention in any country or countries foreign to the United States, together with the right to file such applications and the right to claim for the same the priority rights derived from said United States application under the Patent Laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such patents, utility models, designs or other rights may be granted; and (iii) all forms of industrial property protection, including, without limitation, patents, utility models, inventors' certificates and designs which may be granted for said invention in any country or countries foreign to the United States and all extensions, renewals and reissues thereof, to be held and enjoyed by said ASSIGNEE, its successors, or assigns to the full end of the term or terms for which any and all such patents, utility models, designs or other rights may be granted.

I hereby authorize and request the Director of the U.S. Patent and Trademark Office to issue any and all such Letters Patent to said ASSIGNEE, its successors, or assigns in accordance herewith.

I warrant and covenant that I have the right to sell and assign the interests herein sold and assigned and that I have not executed and will not execute any document or instrument in conflict herewith.

I further covenant and agree that I will communicate to said ASSIGNEE, its successors, legal representatives, or assigns all information known to me relating to said invention or patent application and that I will execute and deliver any papers, make all rightful oaths, testify in any legal proceedings, and perform all other lawful acts necessary or desirable by said ASSIGNEE, its successors, legal representatives, or assigns to perfect title to said invention, to said application including divisions and continuations thereof and to any and all Letters Patent that may be granted therefor or thereon, including reissues or extensions, in said ASSIGNEE, its successors, or assigns, or to assist said ASSIGNEE, its successors, legal representatives, or assigns in obtaining, reissuing, or enforcing Letters Patent of the United States and any and all patents, utility models, designs or other rights that may be granted in the United States or of any country or countries foreign to the United States, for said invention.

DECLARATION

As a below-named inventor, I hereby declare that:

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. § 1001 by fine or imprisonment of not more than five (5) years, or both.

Signature: _____

Inventor: **Ronald** KEFFERSTEIN Date: 1/7/2017

PTO/AIA/15 (10-17)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	20631.1028CON7
First Named Inventor	Drillet et al.
Title	Coated Steel Strips, Coated Stamped Products and Methods
Priority Mail Express® Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✓] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 30] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✓] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 4]
6. **Inventor's Oath or Declaration** [*Total Pages* 5] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✓] A copy from a prior application (37 CFR 1.63(d))
7. [✓] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

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ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
    Name of Assignee _____
11. [ ] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✓] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [ ] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [✓] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [✓] **Other:** TRACK ONE REQUEST (2 Sheets)

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[✓] The address associated with Customer Number: 23280 **OR** [ ] Correspondence address below

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Address					
City		State		Zip Code	
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Signature	/williamcgehris/	Date	May 13, 2021
Name (Print/Type)	William C. Gehris	Registration No. (Attorney/Agent)	38156

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt	
EFS ID:	42682542
Application Number:	17319306
International Application Number:	
Confirmation Number:	1093
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods
First Named Inventor/Applicant Name:	Pascal DRILLET
Customer Number:	23280
Filer:	William C. Gehris/Simon Steiner
Filer Authorized By:	William C. Gehris
Attorney Docket Number:	20631.1028CON7
Receipt Date:	13-MAY-2021
Filing Date:	
Time Stamp:	12:06:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$7160
RAM confirmation Number	E20215CC07023842
Deposit Account	500552
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	WebADS.pdf	152269	no	9
Warnings:					
Information:					
2		110206311028CON6APPLICATIONff.pdf	1690609	yes	34

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Drawings-other than black and white line drawings	31	34
	Abstract	30	30
	Claims	24	29
	Specification	1	23

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3	Oath or Declaration filed	declarations.PDF	645621	no	5
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6		206311028CON7PrelimAmendcskFINALasfiled.pdf	313234 f0730e958e49c07baaea375acb2f09731243b8f	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	9	9
	Claims	3	8
	Preliminary Amendment	1	2

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7	Transmittal of New Application	transmittalltr.PDF	283738 3285bd518c747a8d6c6e5c6d62cd5719ccf0f4622	no	2
Warnings:					
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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Coated Steel Strips, Coated Stamped Products and Methods

CROSS REFERENCE TO RELATED APPLICATIONS

[0000.1] This is a Continuation of U.S. Patent Application No. 13/621,015, filed September 15, 2012 which is a Divisional of U.S. Patent Application No. 12/447,777, filed April 29, 2009, which is a National Phase Application of International Patent Application PCT/IB06/004019, filed October 30, 2006. All of the above patent applications are hereby incorporated by reference herein.

[0001] The present invention relates to, among other things, coated steels, methods of making such coated steels, including hot dipping, methods of using such coated steels, stamping blanks prepared from coated steels, stamped products prepared from coated steels, and to various uses of the invention products such as in spot welding, etc.

[0002] Additional advantages and other features of the present invention will be set forth in part in the description that follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from the practice of the present invention. The advantages of the present invention may be realized and obtained as particularly pointed out in the appended claims. As will be realized, the present invention is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the present invention. The description is to be regarded as illustrative in nature, and not as restrictive.

BACKGROUND OF THE INVENTION

[0003] In recent years the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important, especially in the automotive industry. Fabrication of such parts may include the following main steps:

[0004] Pre-coating of a steel sheets, by hot dipping;

[0005] Trimming or cutting for obtaining blanks;

[0006] Heating the blanks in order to obtain alloying of the steel substrate with the pre-coating, as well as the austenitizing of the steel; and

[0007] Hot forming followed by rapid cooling of the part in order to obtain predominantly martensitic structures. See for Example U.S. Pat. No. 6,296,805, incorporated herein by reference.

[0008] Thanks to an alloying of the pre-coating with the steel substrate, which has the effect of creating intermetallic alloys with high melting temperature, the blanks having such coating may be heated in a temperature range where austenitizing of the metallic substrate takes place, allowing further hardening by quenching.

[0009] Heat treatments of the blanks in view of the intermetallic alloying of the coating and austenitizing of the substrate are most frequently performed in furnaces, where blanks are traveling on rollers. The thermal cycles experienced by the blanks include first a heating phase whose rate is a function of parameters such as blank thickness, furnace temperature, traveling speed, and coating reflectivity. After this heating phase, thermal cycles generally include a holding phase, whose temperature is the regulation temperature of the furnace. Problems however are experienced with the furnace operation: the rollers may become fouled by metallic deposits which come from the pre-coating of the blanks. If these deposits are excessive, maintenance of the rollers has to be performed and productivity is decreased.

[0010] Parts obtained after heating and rapid cooling display very high mechanical resistance and may be used for structural applications, for example for automotive industry applications. These parts must be frequently welded with others and high weldability is required. This means that:

[0011] The welding operation should be performable in a sufficiently wide operating range in order to guarantee that an eventual drift of the nominal welding parameters has no incidence on weld quality. For resistance welding, which is very common in the automotive industry, an operating welding range is defined by the combination of parameters: welding current intensity I and force F applied of the parts during welding being among the most important. A proper combination of these parameters helps to ensure that insufficient nugget diameter is not obtained (caused by too low intensity or too low force) and that no weld expulsion occurs.

[0012] The welding operation should also be performed in such a way that high mechanical resistance is obtained on the weld. This mechanical resistance may be evaluated by tests such as by shear-tensile tests or cross-tensile tests.

SUMMARY OF THE INVENTION

[0013] There remains a need for coated steels which may be conveniently used to prepare shaped parts by a stamping process. There also remains a need for coated steels which may be used to prepare shaped parts by a stamping process which are suitable for welding. There also remains a need for processes for preparing such coated steels and stamped parts.

[0014] The inventors have discovered that certain coated steels in which a base steel strip is at least partially coated (sometimes termed "pre-coated," this prefix indicating that a transformation of the nature of the pre-coating will take place during heat treatment before stamping) on at least one side with a coating of either aluminum or an aluminum alloy and in which the coating has a defined thickness and is preferably substantially uniform, are conveniently formed into shaped parts after heating by stamping and are conveniently welded. In addition, the inventors have discovered that the roller fouling problem described above generally arises from an insufficient degree of intermetallic alloying between the substrate and the metallic pre-coating. Furthermore, it was discovered that the location of the fouling of the rollers corresponds to zones of the blanks in contact with the rollers where the metallic pre-coating thickness locally exceeds the average thickness. While not bound by a particular theory, it is believed that if a pre-coating is locally too thick, intermetallic alloying is insufficient and the pre-coating melts, fouling the rollers. Thus, the inventors have discovered that the control of the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying, allowing one to improve the resistance to the subsequent melting of the coating during travel on rollers.

[0015] The inventors have also discovered that particularly good weldability of aluminized and hot stamped parts is associated with a special succession of coating layers on the parts, proceeding from steel substrate outwards.

[0016] The inventors have also discovered that a specific combination of transfer time between the heating furnace and the stamping die, the amount of deformation during stamping, the temperature of stamping, the cooling rate of the product during stamping, leads to the fabrication of a part with a fully homogeneous martensitic structure and that an increase in ductility or energy absorption of the parts after stamping is obtained by a reduction of sulfur below a critical value, these two benefits being obtained with or without the invention aluminum/aluminum alloy coating, and with other coatings.

[0017] Accordingly, and in view of the above, it is one object of the present invention to provide novel pre-coated steels strips which may be conveniently processed into stamping blanks.

[0018] It is another object of the present invention to provide novel pre-coated steels strips or sheets which may be conveniently formed into parts by stamping.

[0019] It is another object of the present invention to provide novel coated steels which may be conveniently formed into parts by hot stamping.

[0020] It is another object of the present invention to provide novel methods for making such a coated steel.

[0021] It is another object of the present invention to provide novel stamping blanks which are prepared from such a coated steel.

[0022] It is another object of the present invention to provide novel methods of making such stamping blanks.

[0023] It is another object of the present invention to provide novel stamped parts which are prepared from such a coated steel.

[0024] It is another object of the present invention to provide novel methods of making such stamped parts.

[0025] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such stamped parts.

[0026] It is another object of the present invention to provide novel stamped parts.

[0027] It is another object of the present invention to provide novel methods of making welded stamped parts.

[0028] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such welded stamped parts.

[0029] It is another object of the present invention to provide novel welded coated steels and welded stamping blanks.

[0030] It is another object of the present invention to provide novel methods of making such welded coated steels and welded stamping blanks.

[0031] These and other objects, which will become apparent during the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] FIG. 1 illustrates a preferred embodiment of an invention coated part, after heat treatment and stamping. The succession of layers of the coating on the steel substrate is: (a) interdiffusion layer; (b) intermediate layer; (c) Intermetallic layer; and (d) superficial layer. This arrangement is particularly favorable for the further welding of the part.

[0033] FIG. 2 illustrates a coating of a steel substrate after heat treatment and stamping which does not correspond to the invention. This succession of layers (interdiffusion layer and intermetallic layer) yields inferior results in resistance spot welding.

[0034] FIG. 3 illustrates a microstructure of a steel part, hot stamped and cooled under

conditions not according to the invention.

[0035] FIG. 4 illustrates the microstructure of a steel part, hot stamped and cooled according to a preferred set of conditions according to the invention.

[0036] FIG. 5 illustrates the influence of sulfur on the bending angle of parts after hot stamping.

[0037] FIG. 6 illustrates the influence of sulfur on the initiation energy of fracture of parts after hot stamping.

[0038] FIG. 7 shows conditions of furnace temperature as a function of the total dwell time in the furnace for sheets of total thicknesses of from 0.7-1.5 and 1.5-3 mm that provide particularly favorable coatings for welding.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0039] As noted above, the inventors' discovery that certain coated steels, in which a base steel is at least partially pre-coated on at least one side with a coating of either aluminum or an aluminum alloy and in which the pre-coating has a defined thickness and is substantially uniform, are conveniently formed into shaped parts by stamping, forms one basis for the invention.

[0040] In the context of the present invention, the terms first side (or side 1) and second side (or side 2) of the strip or sheet, etc., of base steel refer to the two large, opposite-facing, surfaces which have a surface area defined by the length and width of the strip of base steel. In contrast, the side edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the length and thickness of the strip. The top and bottom edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the width and thickness of the strip. In the following, t_p designates the thickness of the pre-coating, at any considered location on the sides 1 and 2 of a sheet or a blank. In particular, in the case of sheets coated on two sides 1 and 2, t_{p1} stands for the thickness on side 1, and t_{p2} for the thickness on side 2.

According to a highly preferred embodiment t_p is controlled in a precise range, expressed by (t_{pmin}, t_{pmax}), in order to improve the resistance to the fouling of the rollers. The thickness is preferably controlled, both in the longitudinal (or rolling) direction of the strip or sheet, as well in the transverse direction.

[0041] In relation to the problem of the fouling of rollers, the control of the pre-coating thickness on the side of the sheet or blank which is directly in contact with the rollers is especially important. Because different operations can follow the step of coating the steel sheet (for example hot-dip-coating which provides coated sides 1 and 2), it is preferable to carefully control the pre-coating on both sides of the sheet. For example, after any of coiling, handling, cutting, punching, etc., sides 1 and 2 may be not readily identifiable. But when control of t_p is effected on the two sides of the sheet that has been coated (first side and second side) it is not necessary to track sides 1 and 2 as neither side will foul the roller. In addition, it is not necessary to trim the sheet in order to obtain a preferred smaller sheet having a more uniform homogeneity of pre-coating thickness, thus providing a sheet that is pre-coated by, e.g., hot-dipping. In other words, important benefits are obtained when one controls the pre-coating minimum and maximum thickness of the first side (t_{pmin1}, t_{pmax1}) and the pre-coating minimum and maximum thickness of the second side (t_{pmin2}, t_{pmax2}) of the subject steel sheet or blank.

[0039.1] Hot-dip coated steels are the preferred steels herein. However, regardless of the coating method, the pre-coating thickness on one or both sides of the sheet can be measured and monitored continuously on a coating line directly after the coating operation. This may be realized by devices known per se, such as thickness gages relying on X-Ray absorption. At every moment, the measurement of thickness at a given location may be performed for example on an area of a few hundreds of mm.sup.2, this representing the dimension of the zone irradiated by X-Ray.

[0042] In a preferred embodiment, a plurality of such devices are positioned at different distances in the transverse direction of the strip in order to obtain a profile of the thickness of the pre-coating along the strip width.

[0043] The inventors have discovered that the resistance to the pollution or fouling of the rollers in the furnaces is improved when the minimum and maximum thickness respectively of at least one of the first side (t_{pmin1}, t_{pmax1}) and the second side (t_{pmin2}, t_{pmax2}) are respectively equal to 20 and 33 micrometers (a micrometer is the same as a micron and is a metric unit of length equal to one millionth of a meter). In other words, in a preferred embodiment, at every location on at least one face of the sheet or the blank, the thickness t_p of the pre-coating is preferably from 20-33 micrometers in thickness, including 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 and 32 micrometers and all ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 22.34 micrometers). For hot-dip coating, precise control of this range of pre-coating thickness can be realized on an operating line for example using a system of nozzles blowing gas after coating, for example after exit of the strip or sheet from a bath, and by the flatness of the strip. Number, geometry and location of the nozzles, and flow rates are among the main parameters for a precise control of the thickness t_p. Given the present disclosure, one of ordinary skill in this art can control the pre-coating thickness as described herein without undue labor.

[0044] The invention refers to strips produced in industrial conditions, i.e. where control of pre-coating thickness is effective over a wide surface strip, i.e. with a length greater than 100 m, and with a width greater than 600 mm. In such a way, blanks cut or trimmed out these strips display very high homogeneity of pre-coating thickness, and the settings of the heating treatments in the furnace do not have to be changed for being adapted to eventual variations of this thickness.

[0045] While not bound by a particular theory of operation, the inventors believe that several of the benefits of the invention are related to this pre- coating thickness range, such as the following:

[0046] For a pre-coating thickness less than 20 micrometers, the alloyed layer which is formed during the heating of the blank has an insufficient roughness. Thus, the adhesion of subsequent painting is low on this surface, and the corrosion resistance is decreased.

[0047] If the pre-coating thickness is more than 33 micrometers at a given location on a sheet,

the risk is that the difference of thickness between this location and some other locations where the pre-coating is thinner, becomes too important: The settings of the heating treatment in the furnace may be adapted to the thinner value of the pre-coating, but not to the thicker one. Thus, the alloying reaction forming the intermetallic alloy may take place to an insufficient degree since the mean diffusion distance of the elements in the pre-coating becomes significantly less than the local value of the pre-coating thickness. As a matter of results, alloying will become much more difficult in the external (or superficial) part, particularly in the case of high heating rate.

[0048] Thus, in a first embodiment, the present invention provides certain coated steel strips, which comprise a strip of base steel and a pre-coating of aluminum or an aluminum alloy on at least a part of one side of the strip of the base steel. For many applications, the strip of base steel may comprise any type of steel which may be coated with either aluminum or an aluminum alloy. However, for certain applications, such as a structural part of an automobile, it is preferred that the strip of base steel comprise an ultra high strength steel (UHSS). In such cases, it is particularly preferred that the strip of base steel comprises a boron steel.

[0049] The inventors have also discovered that good welding results are achieved if the coating obtained on parts made out of blanks having undergone intermetallic alloying, austenitizing and hot stamping, displays distinctive features. It must be pointed out that this coating is different from the initial pre-coating, since the thermal treatment causes an alloying reaction with the steel substrate which modifies both the physico-chemical nature and the geometry of the pre-coating: in this regard, the inventors have discovered that particularly good weldability of aluminized and hot stamped parts is associated with the following succession of coating layers on the parts, proceeding from steel substrate outwards:

[0050] (a) Interdiffusion layer,

[0051] (b) Intermediate layer,

[0052] (c) Intermetallic layer,

[0053] (d) Superficial layer See, e.g., FIG. 1. In a preferred embodiment these layers are as follows:

[0054] (a) Interdiffusion layer, preferably with medium hardness (e.g., HV50g between 290 and 410, HV50g designating the hardness measured under a load of 50 grams) In a preferred embodiment this layer has the following composition, by weight: 86-95% Fe, 4-10% Al, 0-5% Si

[0055] (b) Intermediate layer (HV50g around 900-1000 e.g., +/-10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% Si

[0056] (c) Intermetallic layer, with hardness HV50g around 580-650, e.g., +/-10%) In a preferred embodiment this layer has the following composition, by weight: 62-67% Fe, 30-34% Al, 2-6% Si

[0057] (d) Superficial layer (HV50g around 900-1000 e.g., +/-10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% In a preferred embodiment the total thickness of layers (a) to (d) is greater than 30 micrometers. In another preferred embodiment, the thickness of layer (a) is less than 15 micrometers, for example 14, 12, 10, 8, 6, 4, 2, or 1 micrometers, and all whole numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 13.84 micrometers).

[0058] The inventors have discovered that high weldability is especially obtained when layers (c) and (d) are essentially continuous (i.e.: occupying at least 90% of the level corresponding to the considered layer) and when less than 10% of layer (c) is present at the extreme surface of the part. Without being bound by a theory, it is thought that this particular layer disposal, in particular layer (a) and, layers (c) and (d) influence the resistivity of the coating both by their intrinsic characteristics and by the effect of roughness. Thus, current flow, heat generation at the surfaces, and nugget formation in the initial stage of spot welding are affected by this particular arrangement. This favorable layer disposition is obtained for example when aluminum- or aluminum alloy pre-coated steel sheets, whose thickness range from, e.g., 0.7 to 3 mm, are heated for 3 to 13 minutes (this dwell time includes the heating phase and the holding time) in a furnace heated to a temperature of 880 to 940° C. Other conditions leading to such favorable layer dispositions are found in FIG. 7:

[0059] For sheets of total thicknesses greater or equal to 0.7 mm, and less than or equal to 1.5

mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by conditions lying within the limits of diagram "ABCD"
For sheets of total thicknesses greater than 1.5 mm, and less than or equal to 3 mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by diagram "EFGH". The heating rate V_c is comprised between 4 and 12° C./s for producing a favorable alloyed layer disposition. In this regard, this "heating rate" reflects the temperature rise which is experienced by the pre-coated steel upon being located in the preheated furnace. V_c is defined as the mean heating rate between 20 and 700° C. The inventors have discovered that the control of V_c in this precise range is a key factor, because it controls directly the nature and the morphology of the alloyed layers which are formed. It is here underlined that the heating rate V_c is different from the mean heating rate, which is the heating rate between room temperature and furnace temperature. The rates of 6, 7, 8, 9, 10, and 11° C./s are included as are all numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 7.7° C./s). In this regard, all of the conditions specified within FIG. 7 are incorporated herein by reference thereto. Particularly preferred conditions are:
[0060] (for thicknesses of 0.7-1.5 mm)
[0061] 930° C., from 3 minutes up to 6 minutes;
[0062] 880° C., from 4 minutes 30 seconds up to 13 minutes (for thicknesses of 1.5 to 3 mm)
[0063] 940° C., from 4 minutes up to 8 minutes;
[0064] 900° C., from 6 minutes 30 seconds up to 13 minutes.
[0064.1]A special advantage arises from pre-coatings whose thickness is comprised between 20 and 33 micrometers, since this thickness range yields favorable layer disposal, and since the homogeneity of the pre-coating thickness is associated to an homogeneity of the coating formed after alliation treatment.

[0065] Heated blanks are thereafter transferred to a die, hot stamped to obtain a part or product, and cooled at a rate of more than 30.degree. C./s. The cooling rate is defined here as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[0066] The strip of base steel is coated with either aluminum or an aluminum alloy.
Commercially pure aluminum is known in the art as Type 2 aluminum, while alloys of aluminum

with 5 to 11% by weight of silicon are known in the art as Type 1 aluminum. Silicon is present in order to prevent the formation of a thick iron-metallic intermetallic layer which reduces adherence and formability. Other alloying elements useful with aluminum herein include iron, between 2.5 and 3% by weight, and calcium, between 15 and 30 ppm by weight, including combinations of two or more thereof with aluminum.

[0067] A typical metal bath for an Al--Si coating generally contains in its basic composition by weight, from 8% to 11% silicon, from 2% to 4% iron, the remainder being aluminum or aluminum alloy, and impurities inherent in processing. Typical composition of Al--Si coating is: Al-9.3% Si-2.8% Fe. Invention coatings are not limited to these compositions, however.

[0068] The strip of base steel used herein may be any which can be coated by a conventional coating technique. For example, the strip of base steel may be any hot rolled strip, such as those prepared by hot rolling a steel slab (either with or without subsequent cold rolling). Typically, the strip of base steel will be stored and transported in the form of a coil both before and after the formation of the coating.

[0069] An example of a preferred steel for the strip of base steel is one having the following composition by weight:

[0070] 0.10%<carbon<0.5%

[0071] 0.5%<manganese<3%

[0072] 0.1%<silicon<1%

[0073] 0.01%<chromium<1%

[0074] titanium<0.2%

[0075] aluminum<0.1%

[0076] phosphorus<0.1%

[0077] sulfur<0.05%

[0078] 0.0005%<boron<0.010%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing. Use of such a steel provides a very high mechanical resistance after thermal treatment and the aluminum-based coating provides a high resistance to corrosion.

[0079] Particularly preferably, the composition by weight of the steel in the strip of base steel is the following:

[0080] 0.15%<carbon<0.25%

[0081] 0.8%<manganese<1.8%

[0082] 0.1%<silicon<0.35%

[0083] 0.01%<chromium<0.5%

[0084] titanium<0.1%

[0085] aluminum<0.1%

[0086] phosphorus<0.1%

[0087] sulfur<0.05%

[0088] 0.002%<boron<0.005%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing.

[0089] A preferred strip herein is 100 m long and 600 mm wide. Preferred thicknesses are 0.7 to 3 mm.

[0090] Even more preferably, in the composition by weight of the sheet, the weight ratio of titanium content with respect to the nitrogen content is in excess of 3.42, believed to be a level at which the boron is no longer able to combine with the nitrogen.

[0091] An example of preferred commercially available steel for use in the strip of base steel is 22MnB5.

[0092] Chromium, manganese, boron and carbon may be added, in the composition of the steel according to the invention, for their effect on hardenability. In addition, carbon makes it possible to achieve high mechanical characteristics thanks to its effect on the hardness of the martensite.

[0093] Aluminum is introduced into the composition, to perform deoxidation in the liquid state and to protect the effectiveness of the boron.

[0094] Titanium, the ratio of the content of which with respect to the nitrogen content should be in excess of 3.42, is introduced for example in order to prevent combining of the boron with the nitrogen, the nitrogen being combined with titanium.

[0095] The alloying elements, Mn, Cr, B, make possible a hardenability allowing hardening in the stamping tools or the use of mild hardening fluids limiting deformation of the parts at the time of thermal treatment. In addition, the composition according to the invention is optimized from the point of view of weldability.

[0096] The steel in the sheet may undergo a treatment for globularization of sulfides performed with calcium, which has the effect of improving the fatigue resistance of the sheet.

[0097] As mentioned above, ultra-high-strength can be provided with the steel sheet coated and hot stamped according to the invention. This high level of strength is sometimes associated with a limited ductility. In applications requiring a higher ductility, in particular when an ability for bending is required from a part or a product, the inventors have discovered that increased ductility can be obtained if sulfur is particularly controlled: when the sulfur level of base steel is lower than or equal to 0.002% (20 ppm), the bending angle can be greater than 60° and enhanced ductility and tearing resistance are obtained on the parts having experienced heat treatment and stamping. Preferred levels include 20, 18, 15, 13, 10, 8, 5, 2, etc ppm sulfur. In fact, this benefit applies to steels in general, and is not limited to coated steels or to steels coated with Al or Al alloy coatings. While not bound by a particular theory, when analyzing causes of premature failure of some parts in bending operations, the inventors observed that failure initiated on sulfide inclusions. It is thus believed that decohesions between inclusions and the martensitic or bainito-martensitic matrix act as stress-concentration factors and trigger further crack propagation in the ductile mode.

[0098] The invention also concerns a process for producing a part starting from an invention coated sheet, then cut into a blank which, after shaping, the coating of the blank is subjected to an increase in temperature at a speed in excess of 4° C./second, but lower than 12° C./second. The heating rate V_c is defined as the mean rate between 20 and 700° C.

[0099] The invention also concerns the use of a hot-rolled steel sheet which then can be cold-rolled and coated, for structural and/or anti-intrusion or substructure parts for a land motor vehicle, such as, for example, a bumper bar, a door reinforcement, a wheel spoke, etc.

[0100] The sheet according to the invention described above can derive, by reason of its processing, from a hot-rolling mill, and possibly may be cold-rerolled again depending on the final thickness desired. It then is coated with an aluminum-based coating, for example by dipping in a bath containing, in addition to the aluminum source/alloy, e.g., from 8% to 11% silicon and from 2% to 4% iron, the sheet having a high mechanical resistance after thermal treatment and a high resistance to corrosion, as well as a good capacity for painting and gluing.

[0101] The coating is preferably controlled as above, and has in particular the function of protecting the basic sheet against corrosion in various conditions. The thermal treatment applied at the time of a hot-forming process or after forming makes it possible to obtain high mechanical characteristics which can exceed 1500 MPa for mechanical resistance and 1200 MPa for yield stress. The final mechanical characteristics are adjustable and depend in particular on the martensite fraction of the structure, on the carbon content of the steel and on the thermal treatment. At the time of thermal treatment performed on a finished part or at the time of a hot-shaping process, the coating forms a layer having a substantial resistance to abrasion, wear, fatigue, shock, as well as a good resistance to corrosion and a good capacity for painting and gluing. The coating makes it possible to avoid different surface-preparation operations such as for steel sheets for thermal treatment not having any coating.

[0102] The steel sheet can be pre-coated by dipping, after pickling, in an aluminum bath containing for example only aluminum or either aluminum and from 8% to 11% silicon and 2% to 4% iron, or only from 2% to 4% iron, or even in an aluminum bath preferably containing from 9% to 10% silicon and 2% to 3.5% iron. The aluminum may be aluminum per se or an aluminum alloy.

[0103] In an example of implementation of a coating of the sheet by dipping in a metal bath containing an aluminum alloy comprising a proportion of approximately 90% aluminum, the

coating layer comprises a first alloy layer in contact with the surface of the steel. This layer, directly in contact with the surface of the sheet, is highly alloyed with iron.

[0104] A second coating layer, on top of the first, contains approximately 90% aluminum and may contain silicon and a small amount of iron, depending on the composition of the bath.

[0105] The first alloy layer may crack when the sheet is submitted to high strains during cold forming operations of the manufacture of parts.

[0106] According to the invention, after the forming of the part, the coating is subjected to an increase in temperature at a speed in excess of 4° C./second. This rise in temperature makes possible a rapid remelting of the aluminum which fills in the cracks generated by the operation of shaping of the part.

[0107] At the time of thermal treatment, the base coating, of aluminum for example, is transformed into a layer alloyed with iron and comprising different phases depending on the thermal treatment and having a considerable hardness which may exceed 600 HV50 g.

[0108] Another advantage of the invention lies in the fact that the diffusion of the iron in the coating is initiated at high temperature. One thus will have a better cohesion between coating and steel in the sheet. In another form of the invention, the thermal treatment may be performed locally, in heavily deformed zones.
According to the invention, the sheet, in the delivery state in a coil or in a is sheet, the thickness of which may range between 0.25 mm and 15 mm, has good forming properties and a good resistance to corrosion as well as a good capacity for painting or gluing. Preferably, the steel sheet or blank has a thickness less than 3 mm, since the cooling rates that may be achieved after quenching are high and help to obtain martensitic structures.

[0109] The steel sheet, a coated product, has a substantial resistance to corrosion in the delivery state, during forming and thermal treatments as well as during usage of the finished part. The presence of the coating at the time of thermal treatment of the parts makes it possible to prevent

any decarburization of the base metal as well as any oxidation. That is an undeniable advantage, in particular in the case of hot forming. Furthermore, heating of the treated part does not require a furnace having a controlled atmosphere to prevent a decarburization.

[0110] Thermal treatment of the metal in the sheet comprising heating at a temperature ranging between Ac1, starting temperature of austenitic transformation when heating, for example 750° C. and 1200° C., in a furnace, for a period which depends on the temperature to be reached and the thickness of the blank. The composition is optimized so as to limit the grain growth at the time of thermal treatment. If the structure sought is completely martensitic, the holding temperature should be in excess of Ac3, for example 840° C., temperature of complete austenitic transformation. The temperature holding should be followed by a cooling adjusted to the final structure sought.

[0111] Blanks are thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the introduction in the stamping press is more 10 seconds, a partial transformation from austenite is susceptible to appear: if obtaining a full martensitic structure is desired, the transfer time between the exit of the furnace and stamping should be less than 10 s.

[0112] The inventors have also discovered that the obtaining of a fully martensitic structure is linked to the amount of deformation in the hot forming operation: the amount of local deformation caused by hot forming is closely linked to the shape of the part or product and may exceed locally 40 or 50% in some particular regions. The inventors found that, when the local strain exceeds a critical value of 10%, the cooling rate must be sufficiently high in order to get a total martensitic transformation. Otherwise, bainitic transformation can take place at a significant amount instead of martensitic transformation. Thus, the risk is that heterogeneous structure appears on parts with complex shape where some locations are much more deformed than others. In this respect, the inventors put into evidence that, on the locations of the parts where the forming strain is higher than 10%, the cooling rate must be increased beyond 50° C./s in order to guarantee full martensitic transformation. The cooling rate is defined as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[0113] But one may also seek to obtain ferrito-bainitic or ferrito-martensitic structures, by a heating at a temperature ranging between Ac1, for example 750° C. and Ac3, for example 840° C., followed by an appropriate cooling. According to the level of resistance to be achieved and the thermal treatment applied, one or several of these constituents is/are present in variable proportions.

[0114] The modulation of thermal treatment parameters makes it possible to achieve, with a given composition, different levels of hot and cold sheet resistance according to the thickness sought. For the highest resistance levels, the structure is composed predominantly of martensite.

[0115] The steel is particularly suited to the production of structural and anti- intrusion parts.

[0116] The invention thus enables one to produce a hot- or cold-rolled steel sheet of a desired thickness, coated, and affording extensive forming possibilities and which, after thermal treatment performed on the finished part, makes it possible to obtain a mechanical resistance in excess of 1000 MPa, a substantial resistance to shocks, fatigue, abrasion and wear, while retaining a good resistance to corrosion as well as a good capacity for welding, painting and gluing.

[0117] The present invention is described by way of certain exemplary embodiments which are not intended to be limiting.

EXAMPLES

Example 1

[0118] In a first example of implementation, a cold rolled steel sheet, 1.9 mm thick, containing by weight 0.23% carbon, 1.25% manganese, 0.017% phosphorus, 0.002% sulfur, 0.27% silicon, 0.062% aluminum, 0.021% copper, 0.019% nickel, 0.208% chromium, 0.005% nitrogen, 0.038% titanium, 0.004% boron, 0.003% calcium-has been pre-coated with an aluminum-based alloy with composition 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable

impurities. According to the conditions of fabrication, namely the settings of the blowing devices on the operating line, sheets of 120 m long and 650 mm wide with various thickness ranges were produced.

[0119] Sheet A (according to the invention): The thickness t_{p1} and t_{p2} on each side of the sheet was controlled to be within the range (20-33) micrometers, at every location of the two faces of the sheet, both in the longitudinal (or rolling) direction and in the transversal direction. Measurement was performed continuously with thickness gages devices relying on X-Ray emission. At every moment, the spot of measurement of each gage was a circular zone of about 20 mm radius. The sheets were afterwards cut into blanks of 1.2.times.0.5 m.sup.2 of overall dimensions.

[0120] Sheet B (reference): On these sheets, the pre-coating thickness had a wider variability since the thickness t_{p1} and t_{p2} on the two sides of the sheet was comprised in the range (30-45) micrometers. Blanks cut out of these sheets exhibit the same pre-coating thickness.

[0121] The blanks were then submitted to heating in a furnace at T=920° C. Heating time was 3 min, with 4 mn holding time. The microstructure is then fully austenitic. Blanks were thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the transfer in the stamping press is more 10 seconds, a partial transformation from austenite was susceptible to appear, thus reducing the mechanical resistance of the stamped part.
The blanks were directly cooled afterwards without hot stamping in order to appreciate the eventual remelting of the coating On series A, no melting of the pre-coating was found. Intermetallic alloying between the pre-coating and the steel substrate occurred completely. On series B, the pre-coating underwent mainly alloying, but some traces of remelting were found, particularly on the former thicker locations of the pre-coating. This partial remelting of the aluminium pre-coating contributes to the progressive fouling of the rollers in the furnace. The sheets according to the invention do not contribute to this progressive buildup on the rollers.

Example 2

[0122] i) Conditions according to the invention: In a second example of implementation, a cold rolled steel sheet, 1.2 mm thick, 120 m long and 650 mm wide, with same composition and same pre-coating as in example 1, has been fabricated. The sheets were afterwards cut into blanks which were heated at 920° C. for 6 mn, this time including the heating phase and the holding time. Heating rate V_c between 20 and 700° C. was 10° C./s. The blanks were finally hot stamped and quenched in order to obtain full martensitic structures. The parts obtained after hot-stamping are covered by a coating, 40 micrometers thick, illustrated at FIG. 1, which has a four layer structure. Starting from the steel substrate, the layers are the following:

[0123] (a) Interdiffusion layer or intermetallic layer, 17 micrometers thick. This layer is itself composed of two sub-layers. Hardness HV50g ranges from 295 to 407, and the mean composition is: 90% Fe, 7% Al, 3% Si.

[0124] (b) Intermediate layer, appearing darker, 8 micrometers thick. This layer has a hardness of 940HV50g and a mean composition, by weight: 43% Fe, 57% Al, 1% Si.

[0125] (c) Intermetallic layer appearing as a pale phase, 8 micrometers thick, displaying a hardness of 610HV50g, a mean composition of 65% Fe, 31% Al, 4% Si

[0126] (d) Darker superficial layer, 7 micrometers thick, 950 HV50g, with a mean composition of 45% Fe, 54% Al, 1% Si Layers (c) and (d) are quasi-continuous, i.e. occupying at least 90% of the level corresponding to the considered layer. In particular, layer (c) does not reach the extreme surface except very exceptionally. Anyway, this layer (c) occupies less than 10% of the extreme surface. ii) Conditions of reference: On the other hand, blanks with the same base material and pre-coating parts were furnace-heated in different conditions: The blanks were heated to 950° C. for 7 minutes, this time including the heating phase. Heating rate V_c was 11° C./s. These conditions correspond to a degree of alloying which is more important than in conditions (i)

[0127] In this coating, the pale intermetallic layer (c), is not continuous and appears as to be scattered within the coating. About 50% of this layer is present at the extreme surface of the part. Moreover, the interdiffusion layer, 10 micrometers thick in contact with the steel substrate is thinner than in the previous case of FIG. 1.

[0128] Resistance spot welding was performed in the two situations i) and ii):

[0129] (i): Coating with quasi-continuous layers (c) and (d), layer (c) occupying less than 10% of the extreme surface

[0130] (ii): Coating with mixed and discontinuous layers, layer (c) occupying more than 10% of the extreme surface Resistance spot welding was performed by superposing two parts and joining them in the following conditions:

[0131] Squeeze force and welding force: 4000 N

[0132] Squeeze time: 50 periods

[0133] Welding and holding time: 18 periods respectively In each condition, the suitable intensity range was determined for obtaining:

[0134] No sputter during welding

[0135] Acceptable nugget size. For the condition i), the weldability range, expressed in terms of current intensity, is 1.4 kA. For the condition ii) the weldability range is extremely small.

[0136] Thus, it may be seen that the coating according to the invention, yields much more satisfactory results.

Example 3

[0137] In a third example of implementation, a cold rolled steel sheet of the example 1 was cut into blanks of 500.times.500 mm.sup.2 which were heated at 920° C., during 6 mn, then hot stamped and cooled in tools, in such conditions that two different cooling rates were obtained:

[0138] (A): Cooling rate: V_A=30° C./s

[0139] (B): Cooling rate: V_B=60° C./s Due to the shape of he parts, different deformation levels .epsilon. were created during hot stamping. In particular, some zones largely strained display deformation levels higher than 30%.

[0140] As illustrated on FIG. 3, metallographic observations reveal that when .epsilon.>10%, partial bainitic or ferritic transformation occurs on parts cooled with V_A=30° C./s, mainly on former austenitic grain boundaries. On the other hand, the parts cooled with V_B=60° C./s display fully martensitic microstructure as illustrated on FIG. 4. The latter structures display superior mechanic resistance and a great homogeneity in the case of mechanical solicitation. Thus, even in products or parts where straining is larger than 10%, the application of cooling according to

the invention guarantees a microstructural and mechanical homogeneity.

Example 4

[0141] In a fourth example of implementation, steel castings containing different values of sulfur, were elaborated. These steels were further hot rolled, then cold rolled steel into sheets, 2.2 mm thick. Sulfur content varies from 11 ppm (0.0011%) to 59 ppm (0.006%) in weight. Apart sulfur, the compositions of these different steel castings comprise in weight: 0.24% carbon, 1.17% manganese, 0.01% phosphorus, 0.25% silicon, 0.045% aluminum, 0.01% copper, 0.02% nickel, 0.2% chromium, 0.04% titanium, 0.003% boron, 0.002% calcium, the remainder being iron and unavoidable impurities. These sheets were pre-coated with an aluminum-based alloy of composition comprising 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable impurities. The sheets were afterwards cut into blanks which were heated at 950° C. for 5 mn, then hot stamped and cooled in tools in order to obtain a full martensitic structure. Mechanical resistance exceeded 1450 MPa. Specimens were extracted according to the transverse sense of rolling direction and submitted to a bending test with alternate bending modes. The inventors put into evidence that the critical bending angle (angle at fracture) is closely related to the sulfur content of the steel: when sulfur content is lower than 0.002%, the bending angle exceeds 60°, which indicates higher ductility and energy absorption. Compact Tensile-Test type specimens were also extracted according to the transverse rolling direction in order to measure the resistance to tearing, i.e. the energy which is necessary for the initiation or propagation of an existing crack. The results, illustrated on FIG. 6, indicate that a initiation energy higher than 18 Joules is achieved when sulfur content is lower than 0.002% in weight. As these qualities of high resistance, high energy absorption and weldability are required in automobile industry, the parts or products fabricated according to the invention will be used with profit for such applications.

[0142] While the above description is clear with regard to the understanding of the invention, the following terms as used in the following list of preferred embodiments and claims have the following noted meanings in order to avoid any confusion:

[0143] pre-coating--the material (Al or Al alloy) coated on or located on at least a portion of the strip or sheet, etc., of base steel to form a pre-coating/base composite, the composite not having been subjected to an alliation reaction between the coated Al or Al alloy material and base steel

[0144] alliation--a reaction between the pre-coating and base steel, to produce at least one intermediate layer different in composition from both the base steel and the pre-coating. The alliation reaction happens during the heat treatment immediately preceding hot stamping. The alliation reaction affects the total thickness of the pre-coating. In a highly preferred embodiment the alliation reaction forms the following layers: (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial as described above;

[0145] pre-coated steel--the pre-coating/base composite, not having been subjected to an alliation reaction between the coated material and base steel;

[0146] coating--the pre-coating after having been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coating comprises layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[0147] coated steel or product--the pre-coated steel or product that has been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coated steel is a strip or sheet, etc., of base steel having thereon an invention coating comprising layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[0148] blank--a shape cut from a strip.

[0149] product--a stamped blank

ABSTRACT

A pre-coated steel strip is provided. The steel strip includesa strip of base steel having a length, a width, a first side, and a second side. The length of the strip is at least 100m and the width is at least 600mm. An aluminum or an aluminum alloy pre-coating is on at least part of at least one of the first or second sides of the strip of base steel. A thickness t_p of the pre-coating is from 20 to 33 micrometers at every location on at least one of the first or second sides. Processes, coated stamped products and land motor vehicles are also provided.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods			
First Named Inventor/Applicant Name:	Pascal DRILLET			
Filer:	William C. Gehris/Simon Steiner			
Attorney Docket Number:	20631.1028CON7			
Filed as Large Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4200	4200
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	10	100	1000
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**7160**

What is claimed is:

1. A pre-coated steel strip, comprising:

(a) a strip of base steel having a length, a width, a first side, and a second side;

(b) said length of said strip of base steel being at least 100m and said width being at least 600mm, and

(c) an aluminum or an aluminum alloy pre-coating on at least part of one of said first and second sides of said strip of base steel,

wherein a thickness t_p of said pre-coating is from 20 to 33 micrometers at every location on at least one of said first and second sides.

2. A method for making a pre-coated steel strip according to claim 1, wherein the pre-coated steel strip has a thickness of not greater than 3 mm.

3. A process for making a hot stamped coated steel sheet product, comprising:

(A) heating an aluminum- or aluminum alloy pre-coated steel sheet in a furnace preheated to a temperature and during a time defined by trapezoid ABCD having heating time, temperature coordinates of about A (3 minutes, 930°C), B (6 minutes, 930 °C), C (13 minutes, 880 °C) and D (4.5 minutes, 880°C) if thickness of said sheet is greater than or equal to 0.7mm and less than or equal to 1.5mm, and by trapezoid EFGH having heating time, temperature coordinates of about E (4 minutes, 940°C), F (8 minutes, 940°C), G (13 minutes, 900°C), and H (6.5 minutes, 900°C) if thickness of said sheet is greater than 1.5mm and less than or equal to 3mm, at a heating rate V_c between 20 and 700°C comprised between 4 and 12°C/s, to obtain a heated blank;

(B) transferring said heated blank to a die; and

(C) stamping said heated blank in said die, to thereby obtain a hot stamped steel sheet product,

wherein the said heated product is cooled at a rate of at least 50°C/s during an interval between when said product exits said furnace and when said product reaches 400°C.

4. A process according to claim 3, wherein said heated blank is deformed by a quantity higher than 10% during said stamping.

5. A process according to claim 3, wherein the elapsed time between said heated blank exits said furnace and said stamping commences is not more than 10 seconds.

6. A process for making a hot stamped coated steel sheet product, comprising : hot dip pre-coating a steel strip having a first side and a second side with aluminum or aluminum alloy to obtain a pre-coated steel strip, the pre-coating thickness on at least one of said first side and said second side of said strip having a thickness of from 20 to 33 μm at every location on at least one of said first and second sides of said strip;

cutting said pre-coated steel strip to obtain a sheet;

heating the sheet in a pre-heated furnace to obtain a heated blank in which the steel is austenitic;

transferring said heated blank to a die while maintaining said steel in the austenitic phase; and

stamping said heated blank in a die to obtain a hot stamped steel sheet product in which the steel microstructure is martensitic.

7. A hot stamped coated steel sheet product, which is prepared by a process comprising:

(A) providing a pre-coated strip according to claim 1, said strip being pre-coated with aluminum or aluminum alloy ;

(B) cutting said pre-coated steel strip to a predetermined size and shape to obtain a sheet ;

(C) heating said steel sheet in a furnace preheated to a temperature and during a time defined by trapezoid ABCD having heating time, temperature coordinates of about A (3 minutes, 930°C), B (6 minutes, 930 °C), C (13 minutes, 880 °C) and D (4.5 minutes, 880°C) if thickness of said product is greater than or equal to 0.7mm and less than or equal to 1.5mm, and by trapezoid EFGH having heating time, temperature coordinates of about E (4 minutes, 940°C), F (8 minutes, 940°C), G (13 minutes, 900°C), and H (6.5 minutes, 900°C) if thickness of said product is greater than 1.5mm and less than or equal to 3mm, to obtain a heated blank;

(D) transferring said heated blank to a die; and

(E) stamping said heated blank in said die, to thereby obtain a hot stamped steel sheet product,

wherein the elapsed time between said heated blank exits said furnace and said stamping commences is not more than 10 seconds, and wherein said heated product cools at a rate higher than 30°C/s during said stamping.

8. A process for making a hot stamped coated steel sheet product, comprising:

(A) providing a heated blank according to claim 7 ;

(B) transferring said heated blank to a die; and

(C) stamping said heated blank in said die, to thereby obtain a hot stamped steel sheet product,

wherein the elapsed time between said heated blank exits said furnace and said stamping commences is not more than 10 seconds, and wherein said heated product cools at such a rate during said stamping that the steel microstructure is martensitic.

9. The pre-coated steel strip according to claim 1, wherein the base steel comprises the following components by weight based on total weight:

0.15%<carbon<0.5%;

0.5%<manganese<3%;

0.1 %<silicon<0.5%;

0.01 %<chromium<1%;

titanium<0.2%;

aluminum<0.1%;

phosphorus<0.1 %;

sulfur<0.05%;

0.0005%<boron<0.08%;

iron; and

impurities inherent in processing.

10. The pre-coated steel strip according to claim 9, wherein the base steel comprises the following components by weight based on total weight:

0.20%<carbon<0.5%;

0.8%<manganese<1.5%;

0.1%<silicon<0.35%;

0.01%<chromium<1%;

titanium<0.1%;

aluminum<0.1%;

phosphorus<0.05%;

sulfur<0.03%;

0.0005%<boron<0.01%,

iron;

and impurities inherent in processing.

11. The pre-coated steel strip according to claim 9, wherein the base steel comprises 20 ppm or less of sulfur.

12. The pre-coated steel strip according to claim 9, wherein the ratio of titanium to nitrogen in the steel sheet in weight % is in excess of 3.42.

13. The pre-coated steel strip according to claim 1 , wherein the aluminum or aluminum alloy pre-coating comprises from 8% to 11% silicon by weight, from 2% to 4% iron by weight, the remainder being aluminum and impurities inherent in processing.

14. The pre-coated steel strip according to claim 9, wherein the aluminum or aluminum alloy pre-coating comprises from 8% to 11% silicon by weight, from 2% to 4% iron by weight, the remainder being aluminum and impurities inherent in processing.

15. A coated steel stamped product, which comprises:

(a) a strip of base steel having a first side and a second side; and

(b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel, wherein:

(i) said coating results from the interdiffusion between said base steel and aluminium or aluminium alloy pre-coating, and

(ii) said coating comprises, proceeding from base steel outwards,

(1) Interdiffusion layer

(2) Intermediate layer

(3) Intermetallic layer

(4) Superficial layer.

wherein said coating has a thickness greater than 30 micrometers

16. A coated steel stamped product according to claim 15, wherein said layer (1) has a thickness less than 15 micrometers

17. A coated steel stamped product according to claim 15, wherein the said layers (3) and (4) are occupying at least 90% of the level corresponding to the considered said layers and wherein less than 10% of layer (3) is present at the extreme surface of the product

18. A coated steel stamped product according to claim 15, wherein the steel in the strip has a composition according to claim 9.

19. A coated steel stamped product according to claim 15, wherein the steel in the strip has a composition according to claim 10.

20. A coated steel stamped product according to claim 15, wherein the steel has a composition according to claim 11.

21. A coated steel stamped product according to claim 15, wherein the steel has a composition according to claim 12.

22. A coated steel stamped product according to claim 15, the aluminum or aluminum alloy pre-coating comprises from 8% to 11% silicon by weight, from 2% to 4% iron by weight, the remainder being aluminum and impurities inherent in processing.

23. A land motor vehicle comprising the heat treated coated steel product according to claim 7 or 15.

24. A land motor vehicle comprising the heat treated coated steel product produced according to claim 3, 6 or 8.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Pascal		DRILLET	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Mailing Address of Inventor:

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Address 2			
City	Rozerieulles	State/Province	
Postal Code	57160	Country i	FR

Inventor 2

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Dominique		Spehner	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Balan	Country of Residence i	FR

Mailing Address of Inventor:

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Address 2			
City	Balan	State/Province	OT
Postal Code	08200	Country i	FR

Inventor 3

Legal Name

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Ronald		Kefferstein	

Residence Information (Select One) ◯ US Residency ◉ Non US Residency ◯ Active US Military Service

City	Saint Mitre Les Ramparts	Country of Residence i	FR

Mailing Address of Inventor:

Address 1	2 rue des Rocaledes		
Address 2			
City	Saint Mitre Les Ramparts	**State/Province**	OT
Postal Code	13920	**Country** i	FR

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	23280		
Email Address	ddk@ddkpatent.com	Add Email	Remove Email

Application Information:

Title of the Invention	Coated Steel Strips, Coated Stamped Products and Methods		
Attorney Docket Number	20631.1028CON7	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country i

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Publication Information:

☒	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	**Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)		
Customer Number	23280				
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16413825	2019-05-16

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16413825	Continuation of	15606770	2017-05-26	10550447	2020-02-04

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15606770	Continuation of	13621015	2012-09-15	9708683	2017-07-18

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13621015	Division of	12447777	2011-03-18	8307680	2012-11-13

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12447777	a 371 of international	PCT/IB06/04019	2006-10-30

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	ArcelorMittal		
Mailing Address Information For Applicant:			
Address 1	24-26, Boulevard d'Avranches		
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Country[i]	LU	Postal Code	L-1160
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	20631.1028CON7
	Application Number	
Title of Invention	Coated Steel Strips, Coated Stamped Products and Methods	

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/williamcgehris/			Date (YYYY-MM-DD)	
First Name	William	Last Name	Gehris	Registration Number	38156

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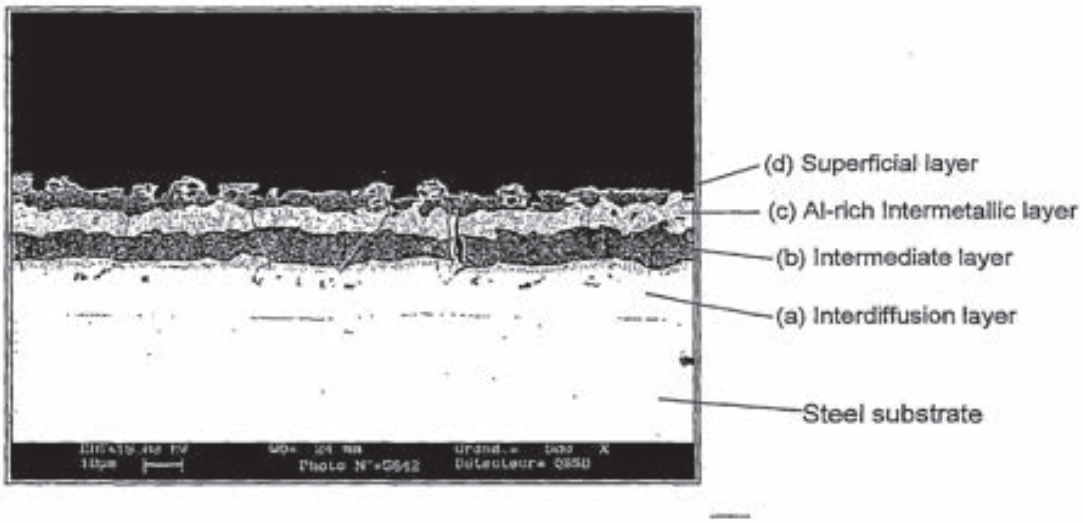

(d) Superficial layer
(c) Al-rich Intermetallic layer
(b) Intermediate layer
(a) Interdiffusion layer
Steel substrate
10µm

Fig. 1

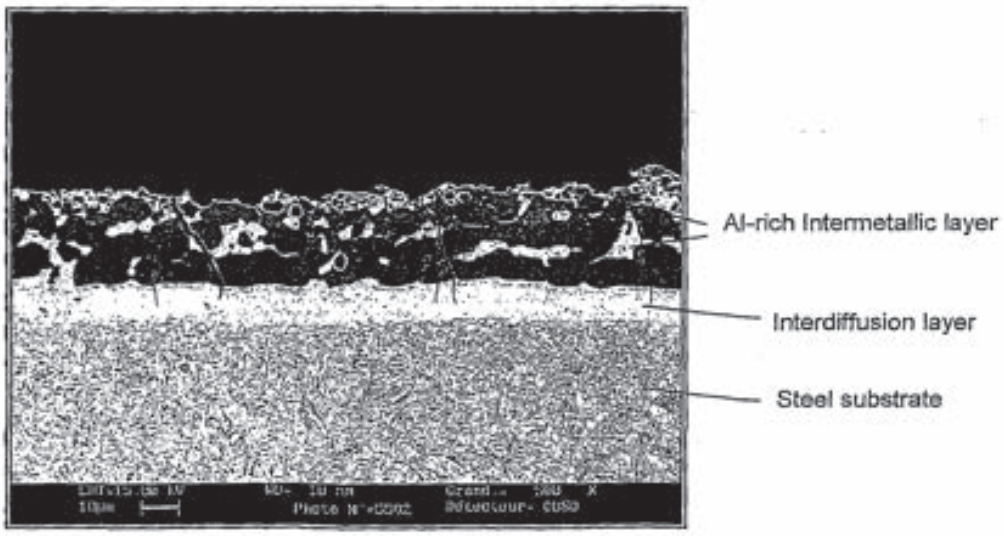

Al-rich Intermetallic layer
Interdiffusion layer
Steel substrate
10µm

Fig.2

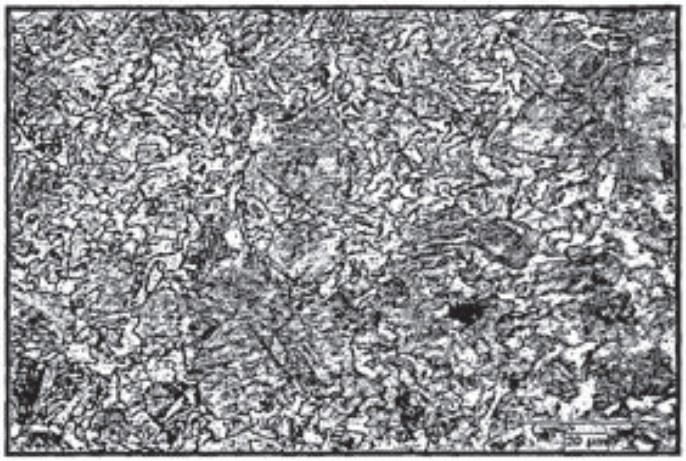


Fig. 3 10µm



Fig. 4 10 µm

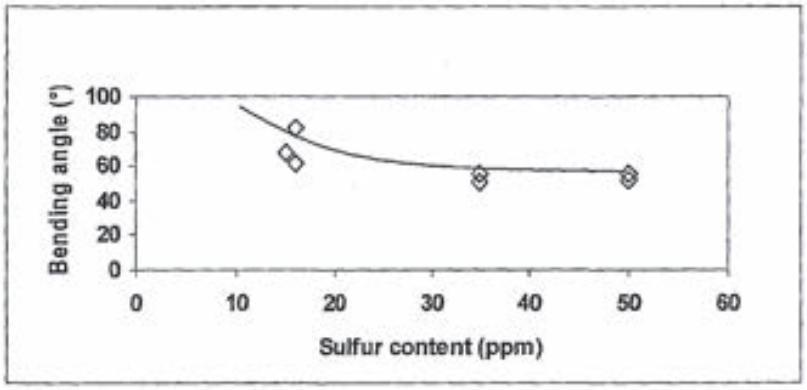

Bending angle (°)
100
80
60
40
20
0
0
10
20
30
40
50
60
Sulfur content (ppm)

Fig. 5

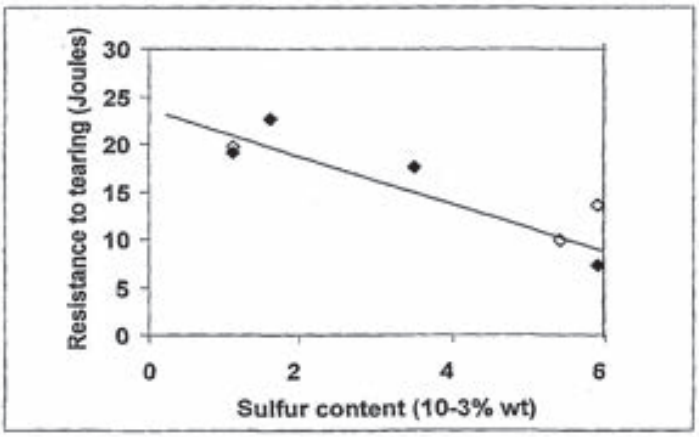

Resistance to tearing (Joules)
30
25
20
15
10
5
0
0
2
4
6
Sulfur content (10-3% wt)

Fig. 6

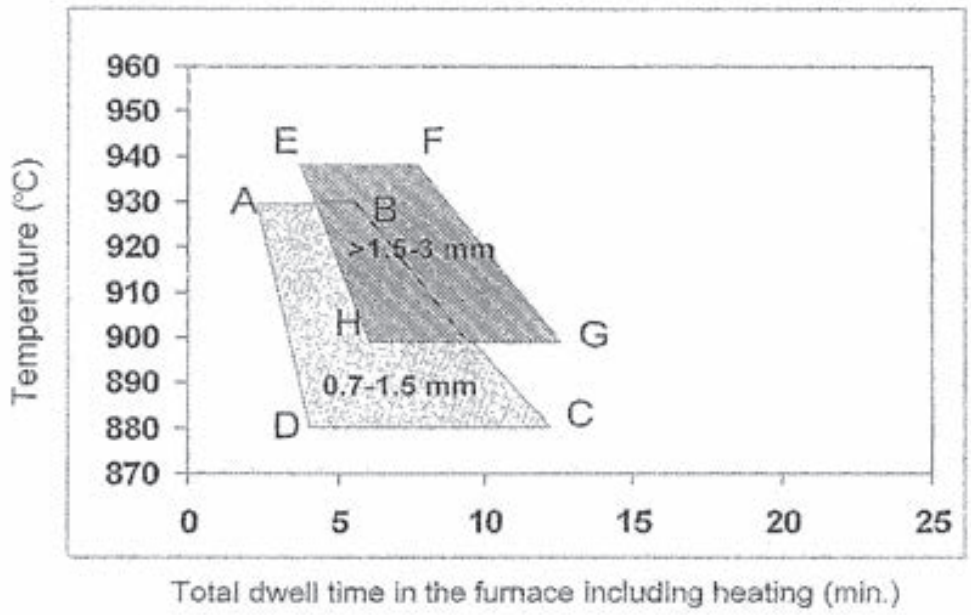

960
950
940
930
920
910
900
890
880
870
Temperature (°C)
0
5
10
15
20
25
Total dwell time in the furnace including heating (min.)
E
F
A
B
>1.5-3 mm
H
G
0.7-1.5 mm
D
C

Fig. 7

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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(Not for submission under 37 CFR 1.99)

Application Number	17319306
Filing Date	2021-05-13
First Named Inventor	Pascal DRILLET
Art Unit	
Examiner Name	
Attorney Docket Number	20631.1028CON7

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	2	4257549	A	1981-03-24	ROBERTSON CO H H	
	3	5495736	A	1996-03-05	Nishi et al.	

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	1	20020114884	A1	2002-08-22	FRIEDERSDORF FRITZ J et al.	

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	First Named Inventor	Pascal DRILLET
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	2	0724919	EP	A2	1996-08-07	HITACHI LTD	In English	
	3	1657004	EP	A1	2006-05-17	ARVEDI GIOVANNI	In English	
	4	2573226	CA	A1	2006-01-19	NIPPON STEEL CORP	In English	
	5	0692549	EP	A1	1996-01-17	UNITAS SA	In English	
	6	1063314	EP	A1	2000-12-27	KAWASAKI STEEL CO	In English	
	7	2720079	FR	A1	1995-11-24	LORRAINE LAMINAGE	See English Abstract and EPO machine translation	
	8	622697	AU	B2	1992-04-16	ARMCO INC	In English	
	9	H08144037	JP	A	1996-06-04	SUMITOMO METAL IND	See English Abstract and EPO machine translation	
	10	0724919	EP	A	2001-08-29	Nishi et al.	See US 5495736	
	11	1657004	EP	A1	2006-05-17	Giovanni et al.	In English	
	12	0692549	EP	A1	1996-01-17	Unitas SA	In English	

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	13	1063314	EP	A1	2000-12-27	KAWASAKI STEEL CO	In English	

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	1	Stahl und Eisen 120 (2000) Nr. 8, Seiten 51 bis 56, "Die neue Verzinkungsanlage 2 bei Eko Stahl", "The new No. 2 hot-dip galvanizing line at Eko Stahl", Autoren: Karl Döring, Jürgen Nathow, Dietrich Kern, Michael Breiter und Dietmar Lowenberg.	
	2	Andrews, K.W. Empirical Formulae for the Calculation of Some Transformation Temperatures. Journal of the Iron and Steel Institute, 203, Part 7, July 1965, 721-727.	
	3	Enlarged Fig. 7 of U.S. 16413825 (present application)	
	4	Low Carbon, Heat-Treatable Boron Steel - Uncoated or Aluminized PreCoated, GM Worldwide Engineering Standards, GMW14400.	
	5	Self-study programme 339, The Passat 2006	
	6	Kahl, Martin, "Some like it hot" Technology focus - Hot stamping, September/October 2004 AMS	
	7	Kolleck, R. et al., "Investigation on induction heating for hot stamping of boron alloyed steel" CIRP Annals - Manufacturing Technology 58, (2009), 275-278	
	8	mose, Masayuki, "Heating and Cooling Technology in the Continuous Annealing" Transactions ISIJ, Vol. 25, 1985, 911-932	

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	First Named Inventor	Pascal DRILLET
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	9	Patent Trial and Appeal Board Final Decision in IPR2019-01275, US 9708683, dated January 5, 2021	
	10	Gokhale, Arun M., "Report on quantitative characterization of the microstructure of Aluminium alloy surface coating on hot-stamped US BOR 1500 steel blanks" School of Materials Science and Engineering, Georgia Institute of Technology, 13 May 2019	
	11	Fan, Dong Wei et al., "Formation of an Aluminide Coating on Hot Stamped Steel" ISIJ International, Vol. 50, No. 11, 2010, pp 1713-1718	
	12	Summons in EP proceeding for EP 09701846, dated 11/18/2016	
	13	Bourouga, Brahim, "Report on the heating of coated steel blanks for hot stamping" Laboratoire de therminque et enqerie de Nantes, 30 Aprill 2019	
	14	"Continuously hot-dip coated strip and sheet of strucutral steels - Technical delivery conditions," European Standard EN 10326, July 2004, NON-EN 10326	
	15	Webpages from Usinorauto.com: "Mechanical Properties (Continued)", May 20, 2003, downloaded from http://www.usinorauto.com/v-ang/produits/definitions4.htm	
	16	"Charakteristische Merkmale 095 - Schmelztauchveredeltes Band und Blech," Stahl-Informations-Zentrum, 2005, see partial translation.	
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	Filing Date	2021-05-13
	First Named Inventor	Pascal DRILLET
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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Name/Print	William C. Gehris	Registration Number	38,156

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International Application Number:	
Confirmation Number:	1093
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods
First Named Inventor/Applicant Name:	Pascal DRILLET
Customer Number:	23280
Filer:	William C. Gehris/Simon Steiner
Filer Authorized By:	William C. Gehris
Attorney Docket Number:	20631.1028CON7
Receipt Date:	18-MAY-2021
Filing Date:	
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Application Type:	Utility under 35 USC 111(a)

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	Attorney Docket Number	20631.1028CON7

	3	1013785	FR	B1	2006-10-25	Laurent	See English translation	
	4	2006051543	JP	A	2006-02-23	Kusumi et al.	See English machine translation, also e.g. US 7867344	

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	1	Mahesh C. Somani, et al., "Dimensional Changes and Microstructural Evolution in a B-bearing Steel in the Simulated Forming and Quenching Process," ISIJ International, 2001, Volume 41, Issue 4, Pages 361-367 ("Somani")	
	2	Declaration of Mel Desart, dated April 16, 2019, relating to attached "High Strength Steels for Automotive Safety Parts," SAE Technical Paper 2001-01-0078. 2001, by Cornette, D., Hourman, T., Hudin, O., Laurent, J., and Reynaert, A."	
	3	Declaration Dr. Michael Miles, dated June 28, 2019 as filed in IPR2019-01275, US Patent No. 9,708,683	
	4	Declaration of Mel Desart, dated May 30, 2019, relating to attached "High Strength Steels for Automotive Safety Parts," SAE 2001 Transactions Journal of Materials & Manufacturing-V110-5, by Corneae, D., Hourman, T., Hudin, 0., Laurent, J., and Reynaert, A."	
	5	Declaration of Dr. Michael L. Knott dated April 22, 2019 realting to attached Somani (Mahesh C. Somani, et al., "Dimensional Changes and Microstructural Evolution in a B-bearing Steel in the Simulated Forming and Quenching Process," ISIJ International, 2001, Volume 41, Issue 4, Pages 361-367 ("Somani")) from University of Michigan's Art, Architecture, and Engineering Library's Technical Services Department	
	6	Publication History from SAE Mobilus, dated May 30, 2019 for Cornette et al., "High Strength Steels for Automotive Safety Parts" SAE Technical Paper Series 2001-01-0078, March 24 001, ISSN: 0148-7191	
	7	Fekete, J., Stibich, A., and Shi, M., "A Comparison of the Response of HSLA and Dual Phase Sheet Steel in Dynamic Crush," SAE Technical Paper 2001-01-3101, 2001	

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	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	8	Robert R. Mayer, "Theoretical Effects of Hydroforming on Crashworthiness of Straight Sections," ASME International Mechanical Engineering Congress and Exposition, Applied Mechanics (2004):591-603	
	9	Publication History from ISIJ International for "Mahesh C. Somani, et al., "Dimensional Changes and Microstructural Evolution in a B-bearing Steel in the Simulated Forming and Quenching Process," ISIJ International, 2001, Volume 41, Issue 4, Pages 361-367 ("Somani")"	
	10	Webster's New Twentieth Century Dictionary (2nd ed. 1964), published by The World Publishing Company	
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	15	Certified Translation of "alliation" and "alliage"	
	16	Ahindra Ghosh, "Secondary Steelmaking, Principles and Applications" (2001), CRC Press	
	17	Åkerström, P. et al., "Material parameter estimation for boron steel from simultaneous cooling and compression experiments," Modelling and Simulation in Materials Science and Engineering. 2005, Vol.13, No.8, p.1291	
	18	ASTM Dictionaly of Engineering Science & Technology, ASTM International 2005	

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	Attorney Docket Number	20631.1028CON7

	19	Chambers Dictionary of Science and Technology, Tenth edition, 1999	
	20	Webster's Third New International Dictionary of the English Language Unabridged, 2003	
	21	Engels, H. et al., "Controlling and Monitoring of the Hot-Stamping Process of Boron-Alloyed Heat-Treated Steels." – p. 135-50 ("Engels"), published in Liewald, M. (Ed.). "New developments in sheet metal forming": Frankfurt a.M.: MATINFO, Werkstoff-Informationsges (2006)	
	22	Declaration of Marcel Thoms of University of Stuttgart dated June 7, 2019 relating to attached "Engels, H. et al., "Controlling and Monitoring of the Hot-Stamping Process of Boron-Alloyed Heat-Treated Steels." – p. 135-50 ("Engels"), published in Liewald, M. (Ed.). "New developments in sheet metal forming": Frankfurt a.M.: MATINFO, Werkstoff-Informationsges (2006)"	
	23	Certified translation of "Stahl"	
	24	Preliminary Opinion issued on June 19, 2019 in opposition proceedings of European Patent Application 06842403.5	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17319306
	Filing Date	2021-05-13
	First Named Inventor	Drillet
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

CERTIFICATION STATEMENT

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Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	38156

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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Examiner Name	
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	1	"Hot-Dip Aluminised Sheet Metal fal AS," Production information re. fire-aluminized sheet metal, August 2007, published by ThyssenKrupp Steel, see English translation	
	2	Naderi et al., "Hot stamping of ultra high strength steels", November 2, 2007	
	3	Self-study programme 339 - Volkswagen Passat, March 2005	
	4	Wikipedia Article on VW Passat, downloaded at https://fr.wikipedia.org/wiki/Volkswagen_Passat, last accessed on August 11, 2016 see machine translation	
	5	Declaration by Th. A. Kop: "On the physicis of heating a blank for hot forming," August 15, 2016	
	6	Declaration by Dr Grigorieva dated 17/10/2016 and curriculum vitae	
	7	Declaration by Dr Grigorieva dated 28/09/2016	
	8	Decision of the District Court of The Hague denying the request for stay and translation dated May 18, 2016, case number C/09/509050-HA ZA 16-435	
	9	Bourouga: "Report on the heating of coated steel blanks for hot stamping by Pr Bourouga," July 31, 2018	
	10	Exerpt of "Harmonized Tariff Schedule of the United States (2003) – Supplement 1", chapter 99, 2003	
	11	Arun M. Gokhale:"Quantitative Characterization and Representation of Global Microstructural Geometry," ASM Handboo, Volume 9: Metallography and Microstructures, G.F. Vander Voort, editor, p428-447	

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	12	Chawla et al:"Microstructure and mechanical behavior of porous sintered steels," Materials Science and Engineering A 390 (2005) 98–112,	
	13	Volkswagen Aktiengesellschaft, "Fahrzeugdaten" including opinion of Ingineurbuero fuer KfZ-Technik GmbH Nr. 18BS-00988JP, observations of notary and partial translation, August 2018 see partial English translation	
	14	D4A-"Evaluation of the porosity of the coating in a reference range of Fig. 1 of D4 [WO2008/053273]" see English translation	
	15	Wilsius et al.:"Status and future trends of hot stamping USIBOR 1500P," Tagungsband zum ersten Erlanger Workshop Warmblechumformung 2006	
	16	D4B-"Evaluation of the porosity of the coating in a reference range of Fig. 1 of D4 [WO2008/053273]" see English translation	
	17	Merklein et al.:"Investigation of the thermo-mechanical properties of hot stamping steels," Journal of Materials Processing Technology, Vol. 177, issues 1-3, July 2006, pages 452-455	
	18	Claim Chart comparing claims of EP2242863B1	
	19	Hein, "Press-hardening of Usibor 1500 P : simulation-based component and process analysis", 18 pages, 9./10. May 2006, and translation thereof, 13 pages	
	20	NEN - EN 10326 standard, July 2004, 25 pages	
	21	Zhao:"Analysis and Application of Axle Housing Hot Stamping Process", Forging Machinery, published in March, 2002, including English translation, 8 pages	
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	23	A technical specification by Ford (1992).	
	24	Aruna Bahadur et al., "Structural Studies of Hot Dip Aluminized Coatings on Mild Steel," Materials Transactions, JIM, Vol. 32, No. 11 (1991), pp. 1053-1061.	
	25	X. Bano, et al., "Heat Treated Boron Steels in the Automobile Industry," 39"' MWSP Conf. Proc., ISS, Vol. XXXV, 1998.	

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Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	38156

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	1	6296805	B1	2001-10-02	Laurent et al.	
	2	7559998	B2	2009-07-14	Nishibata et al.	
	3	8307680		2012-11-13	Drillet et al.	
	4	9708683		2017-07-18	Drillet et al.	
	5	8127449	B2	2012-03-06	Bayer et al.	
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	8	3240269		1966-03-15	Thomas	

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	9	7503116		2009-03-17	Machrowicz et al.	
	10	7217331		2007-03-15	Jambu et al.	
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	12	6815087		2004-11-09	Takagi et al.	
	13	5023113		1991-06-11	Boston et al.	
	14	7137201		2006-11-21	Brodt et al.	

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	1	20080283156	A1	2008-11-20	Laurent et al.	
	2	20070163683	A1	2007-07-19	Schiessl	
	3	20010042393	A1	2001-11-22	Kefferstein et al.	

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	4	20110056594	A1	2011-03-10	Macherey et al.	
	5	20070175040		2007-08-02	Bayer et al.	
	6	20040009366		2004-01-15	Takagi et al.	
	7	20030152796		2003-08-14	Clancy et al.	
	8	20110006491		2011-01-13	Drillet et al.	

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	1	3290199	EP	A1	2018-03-07	Drillet	In English	
	2	2758571	FR	A	1998-07-24	Lorraine	See English Abstract and EPO machine translation	
	3	2006097593	WO	A	2006-09-21	Laurent	See US 2008/0283156	
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	5	2242863	EP	B1	2014-01-08	ArcelorMIttal France	In English	
	6	2005078144	WO	A1	2005-08-25	Audi AG	See US 2007/163683	
	7	2833504	FR	A1	2003-06-20	Usinor	See English Abstract and EPO machine translation	
	8	1013785	EP	A1	2000-06-28	Lorraine Laminage	See English Abstract and EPO machine translation	
	9	2012048841	WO	A1	2012-04-19	Tata Steel IJMUIDEN B. V.	In English	
	10	2012028224	WO	A1	2012-03-08	Tata Steel IJMUIDEN B. V.	In English	
	11	1380666	EP	A1	2004-01-14	NISSAN MOTOR	In English	
	12	3290200	EP	A1	2018-03-07	Drillet	In English	
	13	2008053273	WO	A1	2008-05-08	Drillet	In English	
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	16	02103073	WO	A2	2002-12-27	Nippon Steel Corporation	In English	
	17	3931251	JP		2007-06-13	Laurent	See US 6296805	
	18	2005009642	WO		2005-02-03		See US 8127449	
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	21	2002178069	JP		2002-06-25		See US 7137201	
	22	2008537977	JP		2008-10-02		See US 7708843	
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	25	1829813	CN		2006-09-06		See US 7559998	
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	27	1472068	CN	A	2004-02-04		See US6815087	
	28	720079	FR		1995-11-24		See English Abstract and EPO machine translation	
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	1	Raviere et al, Hot Stamping Experiment and Numerical Simulation of Pre-coated USIBOR1500 Quenchable Steels, SAE 2003-01-2859, 2003	
	2	Merklein, M et al., "Einflussgrößen im Presshärteprozess" Tagungsband 4. Chemnitzer Karosseriekolloquium, November 2005, ISSN: 3-937524-33-9, see English translation	
	3	Forschungsvereinigung Stahlanwendungen e. V., "Forschung für die Praxis P644 - Auslegung des Prozessfensters für die Blechumformung höchstfester Vergütungsstähle bei erhöhten Temperaturen" Düsseldorf: Verlags und Vertriebsgesellschaft mbH, 2006, ISBN: 3-937567-42-9, see partial English translation	
	4	Usinor Auto Groupe website, Product Description, USIBOR Heattreatable manganese-boron steel, bare or precoated 1/3, http://www.usinorauto.com/v_anglaise/produits/fiches/ a_usibor3.htm, Feb. 21, 2003	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17319306
	Filing Date	2021-05-13
	First Named Inventor	Drillet
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	6	Usinor Auto Groupe website, Product Description, USIBOR Heattreatable manganese-boron steel, bare or precoated 3/3, http://www.usinorauto.com/v_anglaise/produits/fiches/ a_usibor3.htm, Apr. 29, 2002	
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	9	Roll et al.: "Prozesskette zum Warmumformen von Blechen," Tagungsband SFU Leichtbau durch Umformtechnik, September 2005, see English translation	
	10	Laurent J.-P. "Hot formed Pre-coated boron steels: A solution of the resistance-formability's dilemma" - 1st European Conference of Experts, 10/14/2003	
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	17	Suehiro, Masayoshi et al., "Properties of Aluminium-coated Steels for Hot-forming" NIPPON STEEL TECHNICAL REPORT No. 88, Juli 2003	
	18	Kefferstein R., "Development of safety and structural automotive parts by hot-stamping, the USIBOR 1500P solution", La Revue de Metallurgie, ATS - JSI 2004	
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	29	Preliminary Opinion of the European Patent Office Board of Appeal on EP 2 242 863 B1, dated July 3, 2018	
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	34	Extended European Search Report EP3290200, dated March 12, 2018	
	35	Declaration of Sascha Sikora, August 29, 2018 see partial English translation	
	36	Remarks re EP2086755 features (Re-adjustment of EP2086755 Application Example 2), see English translation	
	37	Expert opinion re "Citroen C5 VF7RC4HXE76658312, registration date 2005", March 2, 2018, see English translation	
	38	Expert opinion re "Citroen C5 VF7DE4HXB76075211, Registration date 2001", August 15, 2018, see English translaton	

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	Attorney Docket Number	20631.1028CON7

	39	Niederschrift über Tatsachenaufnahme und Beobachtung des Notars anlässlich des Ausbaus eines Bauteils aus einem Fahrzeug, October 22, 2018, see English translation ("Record of facts and observation of the notary on the occasion of the removal of a component from a vehicle and the metallographic preparation")	
	40	DVS Presentation by Carsten Lachmann, Jan 18, 2008	
	41	Application report: Examination of body components with AlSi coating systems, Application No.: 18041806a-A2004 by TAZ GmbH, August 27, 2018, See English translation	
	42	Application report: Examination of body components with AlSi coating systems, Application No.: 18041806a-S2001 by TAZ GmbH, August 27, 2018, see English translation	
	43	Kraftfahrtbundesamt, "Neuzulassungen von Personenkraftwagen", 9 Feb. 2005	
	44	autoscout24.de, "Suchergebnisse "Citroen C5, Erstzulassung 2005"	
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	47	mobile.de, "Suchergebnisse "Citroen C5, Erstzulassung 2001"	
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	49	Evaluation of the porosity of the coating in a reference range of a Fig. (Fig. 22 of Cornette et al., "High Strength Steels for Automotive Safety Parts" SAE Technical Paper Series 2001-01-0078, March 2001, ISSN: 0148-7191) - "Bildanalyse eines Literaturbildes, Applications-Nr. 18041806a-Literaturbild", August 27, 2018, see partial translation	

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	First Named Inventor	Drillet
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	Attorney Docket Number	20631.1028CON7

	50	Boezewinkel et al.: Tata Steel analysis of Volkwagen Passat. Project 11450, Oct. 7, 2017	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Examiner Name	
	Attorney Docket Number	20631.1028CON7

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	57392

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	ARCELORMITTAL
Inventor(s):	Drillet et al.
Application No.:	17319306
Filed:	May 13, 2021
Examiner:	TBD
Attorney Docket No.:	20631.1028CON7
Confirmation No.:	1093
Title:	Coated Steel Strips, Coated Stamped Products and Methods

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 18, 2021

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.56

Sir:

In accordance with the provisions of 37 C.F.R. § 1.97, Applicants hereby make of record the documents listed on the four (4) accompanying Forms PTO/SB/08a for consideration by the Examiner in connection with the examination of the above-identified patent application. While the references are being submitted herewith, some or all of the references may not constitute prior art under the U.S. patent laws.

Applicants respectfully advise the Examiner that some of the references were cited in an *Inter Partes Review* (IPR2019-01275) of U.S. Patent No. 9,708,683, which issued from U.S. Application No. 13/621,015, filed September 15, 2012 and is a parent of the present application. The final decision of the Patent Trial and Appeal Board issue on January 5, 2021 and is listed on the accompanying Forms PTO/SB/08a and has been previously submitted in U.S.

16/413,825 under 37 CFR 1.98(d) to which the current application claims priority to under 35 USC 1.20.

Applicants also respectfully advise the Examiner of the Opposition Proceedings in European counterpart patent applications 06 842 403.5, filed on October 30, 2006, which issued on November 29, 2017 as EP2086755 B1 and 17192410.0 file on October 30, 2006 which issued on August 21, 2019 as EP 3290199 B1.

Copies of the **Non Patent Literature and foreign references** that are listed in the accompanying forms PTO/SB/08a are not submitted herewith as they were submitted in U.S. Patent application 16/413,825, filed May 16, 2019 which the current application claims priority to under 35 USC 1.20. **See 37 CFR 1.98(d).**

This Information Disclosure Statement is filed before the mailing date of the First Office Action, thus no fee is believed to be due.

In the event any fee is due or an overpayment is made in connection with this submission, the Commissioner is hereby authorized to charge said deficiency or credit said overpayment to our Deposit Account No. 50-0552.

Respectfully submitted,
DAVIDSON, DAVIDSON & KAPPEL, LLC

By: /williamcgehris/
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/319,306	05/13/2021		2820	20631.1028CON7	30	2

CONFIRMATION NO. 1093

FILING RECEIPT

23280
Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

Date Mailed: 05/21/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Pascal DRILLET, Rozerieulles, FRANCE;
Dominique Spehner, Balan, FRANCE;
Ronald Kefferstein, Saint Mitre Les Ramparts, FRANCE;

Applicant(s)

ArcelorMittal, Luxembourg, LUXEMBOURG;

Power of Attorney: The patent practitioners associated with Customer Number 23280

Domestic Priority data as claimed by applicant

This application is a CON of 16/413,825 05/16/2019
which is a CON of 15/606,770 05/26/2017 PAT 10550447
which is a CON of 13/621,015 09/15/2012 PAT 9708683
which is a DIV of 12/447,777 03/18/2011 PAT 8307680
which is a 371 of PCT/IB06/04019 10/30/2006

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/20/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/319,306**

Projected Publication Date: 08/26/2021

Non-Publication Request: No

Early Publication Request: Yes

Title

Coated Steel Strips, Coated Stamped Products and Methods

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/319,306

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	30 minus 20 =	* 10			OR	x 100 =	1000
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

23280 7590 06/30/2021

Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

EXAMINER	

ART UNIT	PAPER NUMBER
1784	

NOTIFICATION DATE	DELIVERY MODE
06/30/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ddk@ddkpatent.com

PTOL-90A (Rev. 04/07)

Decision Granting Request for Prioritized Examination (Track I)	Application No. 17/319,306	Applicant(s) DRILLET et al.	
	Examiner CHERYL P GIBSON BAYLOR	Art Unit OPET	AIA (FITF) Status No

1. THE REQUEST FILED 13 May 2021 IS **GRANTED** .

The above-identified application has met the requirements for prioritized examination

A. ☑ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination**. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to CHERYL GIBSON BAYLOR at (571)272-3213. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/CHERYL GIBSON BAYLOR/ Paralegal Specialist, OPET	

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PTO-2298 (Rev. 02-2012)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

23280 7590 07/23/2021
Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

EXAMINER	
SCHLEIS, DANIEL J	

ART UNIT	PAPER NUMBER
1784	

NOTIFICATION DATE	DELIVERY MODE
07/23/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ddk@ddkpatent.com

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 17/319,306	Applicant(s) DRILLET et al.	
	Examiner Daniel J Schleis	Art Unit 1784	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 05/13/2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 25-54 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☐ Claim(s) _____ is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☑ Claim(s) 25-54 are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Election/Restriction

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 25-49, drawn to a hot stamped coated steel product, classified in B32B 15/012.

II. Claims 50-54, drawn to a method of forming a hot stamped coated steel product, classified in C21D 9/46.

The inventions are independent or distinct, each from the other because:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the claimed product of Group I can be made by another and materially different process, including one that does not include pre-coating the steel product prior to stamped, providing a coating after stamping, and annealing or performing a heat treatment to form the respective layers after the product has been stamped.

It is noted that the pre-coating in the product is not defined in structure or in particular composition. Rather, there must simply be interdiffusion between the base steel and the pre-coating. It is possible to have a pre-coating that results in the same product as one formed from a coating that is provided after stamping.

Restriction for examination purposes as indicated is proper because all the inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because one or more of the following reasons apply:

(a) The inventions have acquired a separate status in the art in view of their different classification;

(b) The inventions have acquired a separate status in the art due to their recognized divergent subject matter; and

(c) The inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries).

Applicant is advised that the reply to this requirement to be complete must include (i) an election of an invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention**.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be corrected in compliance with 37 CFR 1.48(a) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the

application. A request to correct inventorship under 37 CFR 1.48(a) must be accompanied by an application data sheet in accordance with 37 CFR 1.76 that identifies each inventor by his or her legal name and by the processing fee required under 37 CFR 1.17(i).

The examiner has required restriction between product or apparatus claims and process claims. Where applicant elects claims directed to the product/apparatus, and all product/apparatus claims are subsequently found allowable, withdrawn process claims that include all the limitations of the allowable product/apparatus claims should be considered for rejoinder. All claims directed to a nonelected process invention must include all the limitations of an allowable product/apparatus claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product/apparatus claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product/apparatus are found allowable, an otherwise proper restriction requirement between product/apparatus claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product/apparatus claim will not be rejoined. See MPEP § 821.04. Additionally, in order for rejoinder to occur, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product/apparatus claims. **Failure to do so may result in no rejoinder.** Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J Schleis whose telephone number is (571)270-5636. The examiner can normally be reached on 10 AM to 4 PM Monday through Friday.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Humera Sheikh can be reached on (571) 272-0604. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel J. Schleis
Primary Examiner
Art Unit 1784

/Daniel J. Schleis/
Primary Examiner, Art Unit 1784

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7

CONFIRMATION NO. 1093

23280
Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

PUBLICATION NOTICE

OC00000012799017

Title: Coated Steel Strips, Coated Stamped Products and Methods

Publication No.US-2021-0262055-A1
Publication Date:08/26/2021

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

THERMALLY CONTROL INTEGRATED HIGH RATE RECHARGING STATION COMBINED WITH DATA CENTER AND NETWORKING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This is a Continuation of U.S. Patent Application No. 16/413,825 filed May 16, 2019, now U.S. Patent No. 11,041,226, which is a Continuation of U.S. Patent Application No. 15/606,770 filed May 26, 2017, now U.S. Patent No. 10,550,447, which is a Continuation of U.S. Patent Application No. 13/621,015, filed September 15, 2012, now U.S. Patent 9,708,683, which is a Divisional of U.S. Patent Application No. 12/447,777, filed April 29, 2009, now U.S. Patent No. 8,307,680, which is a National Phase Application of International Patent Application PCT/IB06/004019, filed October 30, 2006. All of the above patent applications are hereby incorporated by reference herein.

[0002] The present invention relates to, among other things, coated steels, methods of making such coated steels, including hot dipping, methods of using such coated steels, stamping blanks prepared from coated steels, stamped products prepared from coated steels, and to various uses of the invention products such as in spot welding, etc.

[0003] Additional advantages and other features of the present invention will be set forth in part in the description that follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from the practice of the present invention. The advantages of the present invention may be realized and obtained as particularly pointed out in the appended claims. As will be realized, the present invention is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the present invention. The description is to be regarded as illustrative in nature, and not as restrictive.

BACKGROUND OF THE INVENTION

[0004] In recent years the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important, especially in the automotive industry. Fabrication of such parts may include the following main steps:

[0005] Pre-coating of a steel sheets, by hot dipping;

[0006] Trimming or cutting for obtaining blanks;

[0007] Heating the blanks in order to obtain alloying of the steel substrate with the pre-coating, as well as the austenitizing of the steel; and

[0008] Hot forming followed by rapid cooling of the part in order to obtain predominantly martensitic structures, See for Example U.S. Pat. No. 6,296,805, incorporated herein by reference.

[0009] Thanks to an alloying of the pre-coating with the steel substrate, which has the effect of creating intermetallic alloys with high melting temperature, the blanks having such coating may be heated in a temperature range where austenitizing of the metallic substrate takes place, allowing further hardening by quenching.

[0010] Heat treatments of the blanks in view of the intermetallic alloying of the coating and austenitizing of the substrate are most frequently performed in furnaces, where blanks are traveling on rollers. The thermal cycles experienced by the blanks include first a heating phase whose rate is a function of parameters such as blank thickness, furnace temperature, traveling speed, and coating reflectivity. After this heating phase, thermal cycles generally include a holding phase, whose temperature is the regulation temperature of the furnace. Problems however are experienced with the furnace operation: the rollers may become fouled by metallic deposits which come from the pre-coating of the blanks. If these deposits are excessive, maintenance of the rollers has to be performed and productivity is decreased.

[0011] Parts obtained after heating and rapid cooling display very high mechanical resistance and may be used for structural applications, for example for automotive industry applications. These parts must be frequently welded with others and high weldability is required. This means that:

[0012] The welding operation should be performable in a sufficiently wide operating range in order to guarantee that an eventual drift of the nominal welding parameters has no incidence on weld quality. For resistance welding, which is very common in the automotive industry, an

operating welding range is defined by the combination of parameters: welding current intensity and force F applied of the parts during welding being among the most important. A proper combination of these parameters helps to ensure that insufficient nugget diameter is not obtained (caused by too low intensity or too low force) and that no weld expulsion occurs.

[0013] The welding operation should also be performed in such a way that high mechanical resistance is obtained on the weld. This mechanical resistance may be evaluated by tests such as by shear-tensile tests or cross-tensile tests.

SUMMARY OF THE INVENTION

[0014] There remains a need for coated steels which may be conveniently used to prepare shaped parts by a stamping process. There also remains a need for coated steels which may be used to prepare shaped parts by a stamping process which are suitable for welding. There also remains a need for processes for preparing such coated steels and stamped parts.

[0015] The inventors have discovered that certain coated steels in which a base steel strip is at least partially coated (sometimes termed "pre-coated," this prefix indicating that a transformation of the nature of the pre-coating will take place during heat treatment before stamping) on at least one side with a coating of either aluminum or an aluminum alloy and in which the coating has a defined thickness and is preferably substantially uniform, are conveniently formed into shaped parts after heating by stamping and are conveniently welded. In addition, the inventors have discovered that the roller fouling problem described above generally arises from an insufficient degree of intermetallic alloying between the substrate and the metallic pre-coating. Furthermore, it was discovered that the location of the fouling of the rollers corresponds to zones of the blanks in contact with the rollers where the metallic pre-coating thickness locally exceeds the average thickness. While not bound by a particular theory, it is believed that if a pre-coating is locally too thick, intermetallic alloying is insufficient and the pre-coating melts, fouling the rollers. Thus, the inventors have discovered that the control of the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying, allowing one to improve the resistance to the subsequent melting of the coating during travel on rollers.

[0016] The inventors have also discovered that particularly good weldability of aluminized and hot stamped parts is associated with a special succession of coating layers on the parts, proceeding from steel substrate outwards.

[0017] The inventors have also discovered that a specific combination of transfer time between the heating furnace and the stamping die, the amount of deformation during stamping, the temperature of stamping, the cooling rate of the product during stamping, leads to the fabrication of a part with a fully homogeneous martensitic structure and that an increase in ductility or energy absorption of the parts after stamping is obtained by a reduction of sulfur below a critical value, these two benefits being obtained with or without the invention aluminum/aluminum alloy coating, and with other coatings.

[0018] Accordingly, and in view of the above, it is one object of the present invention to provide novel pre-coated steels strips which may be conveniently processed into stamping blanks.

[0019] It is another object of the present invention to provide novel pre-coated steels strips or sheets which may be conveniently formed into parts by stamping.

[0020] It is another object of the present invention to provide novel coated steels which may be conveniently formed into parts by hot stamping.

[0021] It is another object of the present invention to provide novel methods for making such a coated steel.

[0022] It is another object of the present invention to provide novel stamping blanks which are prepared from such a coated steel.

[0023] It is another object of the present invention to provide novel methods of making such stamping blanks.

[0024] It is another object of the present invention to provide novel stamped parts which are prepared from such a coated steel.

[0025] It is another object of the present invention to provide novel methods of making such stamped parts.

[0026] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such stamped parts.

[0027] It is another object of the present invention to provide novel stamped parts.

[0028] It is another object of the present invention to provide novel methods of making welded stamped parts.

[0029] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such welded stamped parts.

[0030] It is another object of the present invention to provide novel welded coated steels and welded stamping blanks.

[0031] It is another object of the present invention to provide novel methods of making such welded coated steels and welded stamping blanks.

[0032] These and other objects, which will become apparent during the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] FIG. 1 illustrates a preferred embodiment of an invention coated part, after heat treatment and stamping. The succession of layers of the coating on the steel substrate is: (a) interdiffusion layer; (b) intermediate layer; (c) Intermetallic layer; and (d) superficial layer. This arrangement is particularly favorable for the further welding of the part.

[0034] FIG. 2 illustrates a coating of a steel substrate after heat treatment and stamping which does not correspond to the invention. This succession of layers (interdiffusion layer and intermetallic layer) yields inferior results in resistance spot welding.

[0035] FIG. 3 illustrates a microstructure of a steel part, hot stamped and cooled under conditions not according to the invention.

[0036] FIG. 4 illustrates the microstructure of a steel part, hot stamped and cooled according to a preferred set of conditions according to the invention.

[0037] FIG. 5 illustrates the influence of sulfur on the bending angle of parts after hot stamping.

[0038] FIG. 6 illustrates the influence of sulfur on the initiation energy of fracture of parts after hot stamping.

[0039] FIG. 7 shows conditions of furnace temperature as a function of the total dwell time in the furnace for sheets of total thicknesses of from 0.7-1.5 and 1.5-3 mm that provide particularly favorable coatings for welding.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0040] As noted above, the inventors' discovery that certain coated steels, in which a base steel is at least partially pre-coated on at least one side with a coating of either aluminum or an aluminum alloy and in which the pre-coating has a defined thickness and is substantially uniform, are conveniently formed into shaped parts by stamping, forms one basis for the invention.

[0041] In the context of the present invention, the terms first side (or side 1) and second side (or side 2) of the strip or sheet, etc., of base steel refer to the two large, opposite-facing, surfaces which have a surface area defined by the length and width of the strip of base steel. In contrast, the side edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the length and thickness of the strip. The top and bottom edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the width and thickness of the strip. In the following, t_p designates the thickness of the pre-coating, at any considered location on the sides 1 and 2 of a sheet or a blank. In particular, in the case of sheets coated on two sides 1 and 2, t_p1 stands for the thickness on side 1, and t_p2 for the thickness on side 2.

[0042] According to a highly preferred embodiment t_p is controlled in a precise range, expressed by (t_{pmin}, t_{pmax}) in order to improve the resistance to the fouling of the rollers. The thickness is preferably controlled, both in the longitudinal (or rolling) direction of the strip or sheet, as well in the transverse direction.

[0043] In relation to the problem of the fouling of rollers, the control of the pre-coating thickness on the side of the sheet or blank which is directly in contact with the rollers is especially important. Because different operations can follow the step of coating the steel sheet (for example hot-dip-coating which provides coated sides 1 and 2), it is preferable to carefully control the pre-coating on both sides of the sheet. For example, after any of coiling, handling, cutting, punching, etc., sides 1 and 2 may be not readily identifiable. But when control of tp is effected on the two sides of the sheet that has been coated (first side and second side) it is not necessary to track sides 1 and 2 as neither side will foul the roller. In addition, it is not necessary to trim the sheet in order to obtain a preferred smaller sheet having a more uniform homogeneity of pre-coating thickness, thus providing a sheet that is pre-coated by, e.g., hot-dipping. In other words, important benefits are obtained when one controls the pre-coating minimum and maximum thickness of the first side (t_{pmin1}, t_{pmax1}) and the pre-coating minimum and maximum thickness of the second side (t_{pmin2}, t_{pmax2}) of the subject steel sheet or blank.

[0044] Hot-dip coated steels are the preferred steels herein. However, regardless of the coating method, the pre-coating thickness on one or both sides of the sheet can be measured and monitored continuously on a coating line directly after the coating operation. This may be realized by devices known per se, such as thickness gages relying on X-Ray absorption. At every moment, the measurement of thickness at a given location may be performed for example on an area of a few hundreds of mm.sup.2, this representing the dimension of the zone irradiated by X-Ray.

[0045] In a preferred embodiment, a plurality of such devices are positioned at different distances in the transverse direction of the strip in order to obtain a profile of the thickness of the pre-coating along the strip width.

[0046] The inventors have discovered that the resistance to the pollution or fouling of the rollers in the furnaces is improved when the minimum and maximum thickness respectively of at least one of the first side (t_{pmin1}, t_{pmax1}) and the second side (t_{pmin2}, t_{pmax2}) are respectively equal to 20 and 33 micrometers (a micrometer is the same as a micron and is a metric unit of length equal to one millionth of a meter). In other words, in a preferred embodiment, at every location on at least one face of the sheet or the blank, the thickness t_p of the pre-coating is preferably from 20-33

micrometers in thickness, including 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 and 32 micrometers and all ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 22.34 micrometers). For hot-dip coating, precise control of this range of pre-coating thickness can be realized on an operating line for example using a system of nozzles blowing gas after coating, for example after exit of the strip or sheet from a bath, and by the flatness of the strip. Number, geometry and location of the nozzles, and flow rates are among the main parameters for a precise control of the thickness t_p. Given the present disclosure, one of ordinary skill in this art can control the pre-coating thickness as described herein without undue labor.

[0047] The invention refers to strips produced in industrial conditions, i.e. where control of pre-coating thickness is effective over a wide surface strip, i.e. with a length greater than 100 m, and with a width greater than 600 mm. In such a way, blanks cut or trimmed out these strips display very high homogeneity of pre-coating thickness, and the settings of the heating treatments in the furnace do not have to be changed for being adapted to eventual variations of this thickness.

[0048] While not bound by a particular theory of operation, the inventors believe that several of the benefits of the invention are related to this pre-coating thickness range, such as the following:

[0049] For a pre-coating thickness less than 20 micrometers, the alloyed layer which is formed during the heating of the blank has an insufficient roughness. Thus, the adhesion of subsequent painting is low on this surface, and the corrosion resistance is decreased.

[0050] If the pre-coating thickness is more than 33 micrometers at a given location on a sheet, the risk is that the difference of thickness between this location and some other locations where the pre-coating is thinner, becomes too important: The settings of the heating treatment in the furnace may be adapted to the thinner value of the pre-coating, but not to the thicker one. Thus, the alloying reaction forming the intermetallic alloy may take place to an insufficient degree since the mean diffusion distance of the elements in the pre-coating becomes significantly less than the local value of the pre-coating thickness. As a matter of results, alloying will become much more difficult in the external (or superficial) part, particularly in the case of high heating rate.

[0051] Thus, in a first embodiment, the present invention provides certain coated steel strips, which comprise a strip of base steel and a pre-coating of aluminum or an aluminum alloy on at least a part of one side of the strip of the base steel. For many applications, the strip of base steel may comprise any type of steel which may be coated with either aluminum or an aluminum alloy. However, for certain applications, such as a structural part of an automobile, it is preferred that the strip of base steel comprise an ultra high strength steel (UHSS). In such cases, it is particularly preferred that the strip of base steel comprises a boron steel.

[0052] The inventors have also discovered that good welding results are achieved if the coating obtained on parts made out of blanks having undergone intermetallic alloying, austenitizing and hot stamping, displays distinctive features. It must be pointed out that this coating is different from the initial pre-coating, since the thermal treatment causes an alloying reaction with the steel substrate which modifies both the physico-chemical nature and the geometry of the pre-coating: in this regard, the inventors have discovered that particularly good weldability of aluminized and hot stamped parts is associated with the following succession of coating layers on the parts, proceeding from steel substrate outwards:

[0053] (a) Interdiffusion layer,

[0054] (b) Intermediate layer,

[0055] (c) Intermetallic layer,

[0056] (d) Superficial layer See, e.g., FIG. 1. In a preferred embodiment these layers are as follows:

[0057] (a) Interdiffusion layer, preferably with medium hardness (e.g., HV50g between 290 and 410, HV50g designating the hardness measured under a load of 50 grams) In a preferred embodiment this layer has the following composition, by weight: 86-95% Fe, 4-10% Al, 0-5% Si

[0058] (b) Intermediate layer (HV50g around 900-1000 e.g., +/−10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% Si

[0059] (c) Intermetallic layer, with hardness HV50g around 580-650, e.g., +/−10%) In a preferred embodiment this layer has the following composition, by weight: 62-67% Fe, 30-34% Al, 2-6% Si

[0060] (d) Superficial layer (HV50g around 900-1000 e.g., +/−10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% In a preferred embodiment the total thickness of layers (a) to (d) is greater than 30 micrometers. In another preferred embodiment, the thickness of layer (a) is less than 15 micrometers, for example 14, 12, 8, 6, 4, 2, or 1 micrometers, and all whole numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 13.84 micrometers

[0061] The inventors have discovered that high weldability is especially obtained when layers (c) and (d) are essentially continuous (i.e.: occupying at least 90% of the level corresponding to the considered layer) and when less than 10% of layer (c) is present at the extreme surface of the part. Without being bound by a theory, it is thought that this particular layer disposal, in particular layer (a) and, layers (c) and (d) influence the resistivity of the coating both by their intrinsic characteristics and by the effect of roughness. Thus, current flow, heat generation at the surfaces, and nugget formation in the initial stage of spot welding are affected by this particular arrangement. This favorable layer disposition is obtained for example when aluminum- or aluminum alloy pre-coated steel sheets, whose thickness range from, e.g., 0.7 to 3 mm, are heated for 3 to 13 minutes (this dwell time includes the heating phase and the holding time) in a furnace heated to a temperature of 880 to 940° C. Other conditions leading to such favorable layer dispositions are found in FIG. 7:

[0062] For sheets of total thicknesses greater or equal to 0.7 mm, and less than or equal to 1.5 mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by conditions lying within the limits of diagram "ABCD." For sheets of total thicknesses greater than 1.5 mm, and less than or equal to 3 mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by diagram "EFGH". The heating rate V_c is comprised between 4 and 12° C./s for producing a favorable alloyed layer disposition. In this regard, this "heating rate" reflects the temperature rise

which is experienced by the pre-coated steel upon being located in the preheated furnace. V_c is defined as the mean heating rate between 20 and 700° C. The inventors have discovered that the control of V_c in this precise range is a key factor, because it controls directly the nature and the morphology of the alloyed layers which are formed. It is here underlined that the heating rate V_c is different from the mean heating rate, which is the heating rate between room temperature and furnace temperature. The rates of 6, 7, 8, 9, 10, and 11° C./s are included as are all numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 7.7° C./s). In this regard, all of the conditions specified within FIG. 7 are incorporated herein by reference thereto. Particularly preferred conditions are:

[0063] (for thicknesses of 0.7-1.5 mm)

[0064] 930° C., from 3 minutes up to 6 minutes;

[0065] 880° C., from 4 minutes 30 seconds up to 13 minutes (for thicknesses of 1.5 to 3 mm)

[0066] 940° C., from 4 minutes up to 8 minutes;

[0067] 900° C., from 6 minutes 30 seconds up to 13 minutes.

[0068] A special advantage arises from pre-coatings whose thickness is comprised between 20 and 33 micrometers, since this thickness range yields favorable layer disposal, and since the homogeneity of the pre-coating thickness is associated to an homogeneity of the coating formed after alliation treatment.

[0069] Heated blanks are thereafter transferred to a die, hot stamped to obtain a part or product, and cooled at a rate of more than 30.degree.C./s, The cooling rate is defined here as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[0070] The strip of base steel is coated with either aluminum or an aluminum alloy. Commercially pure aluminum is known in the art as Type 2 aluminum, while alloys of aluminum with 5 to 11% by weight of silicon are known in the art as Type 1 aluminum. Silicon is present in order to prevent the formation of a thick iron-metallic intermetallic layer which reduces adherence and formability. Other alloying elements useful with aluminum herein include iron,

between 2.5 and 3% by weight, and calcium, between 15 and 30 ppm by weight, including combinations of two or more thereof with aluminum.

[0071] A typical metal bath for an Al—Si coating generally contains in its basic composition by weight, from 8% to 11% silicon, from 2% to 4% iron, the remainder being aluminum or aluminum alloy, and impurities inherent in processing. Typical composition of Al—Si coating is: Al—9.3% Si—2.8% Fe. Invention coatings are not limited to these compositions, however.

[0072] The strip of base steel used herein may be any which can be coated by a conventional coating technique. For example, the strip of base steel may be any hot rolled strip, such as those prepared by hot rolling a steel slab (either with or without subsequent cold rolling). Typically, the strip of base steel will be stored and transported in the form of a coil both before and after the formation of the coating.

[0073] An example of a preferred steel for the strip of base steel is one having the following composition by weight:

[0074] 0.10%<carbon<0.5%

[0075] 0.5%<manganese<3%

[0076] 0.1%<silicon<1%

[0077] 0.01%<chromium<1%

[0078] titanium<0.2%

[0079] aluminum<0.1%

[0080] phosphorus<0.1%

[0081] sulfur<0.05%

[0082] 0.0005%<boron<0.010%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing. Use of such a steel provides a very high

mechanical resistance after thermal treatment and the aluminum-based coating provides a high resistance to corrosion.

[0083] Particularly preferably, the composition by weight of the steel in the strip of base steel is the following:

[0084] 0.15%<carbon<0.25%

[0085] 0.8%<manganese<1.8%

[0086] 0.1%<silicon<0.35%

[0087] 0.01%<chromium<0.5%

[0088] titanium<0.1%

[0089] aluminum<0.1%

[0090] phosphorus<0.1%

[0091] sulfur<0.05%

[0092] 0.002%<boron<0.005%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing.

[0093] A preferred strip herein is 100 m long and 600 mm wide. Preferred thicknesses are 0.7 to 3 mm.

[0094] Even more preferably, in the composition by weight of the sheet, the weight ratio of titanium content with respect to the nitrogen content is in excess of 3.42, believed to be a level which the boron is no longer able to combine with the nitrogen.

[0095] An example of preferred commercially available steel for use in the strip of base steel is 22MnB5.

[0096] Chromium, manganese, boron and carbon may be added, in the composition of the steel according to the invention, for their effect on hardenability. In addition, carbon makes it possible to achieve high mechanical characteristics thanks to its effect on the hardness of the martensite.

[0097] Aluminum is introduced into the composition, to perform deoxidation in the liquid state and to protect the effectiveness of the boron.

[0098] Titanium, the ratio of the content of which with respect to the nitrogen content should be in excess of 3.42, is introduced for example in order to prevent combining of the boron with the nitrogen, the nitrogen being combined with titanium.

[0099] The alloying elements, Mn, Cr, B, make possible a hardenability allowing hardening in the stamping tools or the use of mild hardening fluids limiting deformation of the parts at the time of thermal treatment. In addition, the composition according to the invention is optimized from the point of view of weldability.

[00100] The steel in the sheet may undergo a treatment for globularization of sulfides performed with calcium, which has the effect of improving the fatigue resistance of the sheet.

[00101] As mentioned above, ultra-high-strength can be provided with the steel sheet coated and hot stamped according to the invention. This high level of strength is sometimes associated with a limited ductility. In applications requiring a higher ductility, in particular when an ability for bending is required from a part or a product, the inventors have discovered that increased ductility can be obtained if sulfur is particularly controlled: when the sulfur level of base steel is lower than or equal to 0.002% (20 ppm), the bending angle can be greater than 60° and enhanced ductility and tearing resistance are obtained on the parts having experienced heat treatment and stamping. Preferred levels include 20, 18, 15, 13, 10, 8, 5, etc ppm sulfur. In fact, this benefit applies to steels in general, and is not limited to coated steels or to steels coated with Al or Al alloy coatings. While not bound by a particular theory, when analyzing causes of premature failure of some parts in bending operations, the inventors observed that failure initiated on sulfide inclusions. It is thus believed that decohesions between inclusions and the martensitic or bainito-martensitic matrix act as stress-concentration factors and trigger further crack propagation in the ductile mode.

[00102] The invention also concerns a process for producing a part starting from an invention coated sheet, then cut into a blank which, after shaping, the coating of the blank is subjected to an increase in temperature at a speed in excess of 4° C./second, but lower than 12° C./second. The heating rate V_c is defined as the mean rate between 20 and 700° C.

[00103] The invention also concerns the use of a hot-rolled steel sheet which then can be cold-rolled and coated, for structural and/or anti-intrusion or substructure parts for a land motor vehicle, such as, for example, a bumper bar, a door reinforcement, a wheel spoke, etc.

[00104] The sheet according to the invention described above can derive, by reason of its processing, from a hot-rolling mill, and possibly may be cold-rerolled again depending on the final thickness desired. It then is coated with an aluminum-based coating, for example by dipping in a bath containing, in addition to the aluminum source/alloy, e.g., from 8% to 11% silicon and from 2% to 4% iron, the sheet having a high mechanical resistance after thermal treatment and a high resistance to corrosion, as well as a good capacity for painting and gluing.

[00105] The coating is preferably controlled as above, and has in particular the function of protecting the basic sheet against corrosion in various conditions. The thermal treatment applied at the time of a hot-forming process or after forming makes it possible to obtain high mechanical characteristics which can exceed 1500 MPa for mechanical resistance and 1200 MPa for yield stress. The final mechanical characteristics are adjustable and depend in particular on the martensite fraction of the structure, on the carbon content of the steel and on the thermal treatment. At the time of thermal treatment performed on a finished part or at the time of a hot-shaping process, the coating forms a layer having a substantial resistance to abrasion, wear, fatigue, shock, as well as a good resistance to corrosion and a good capacity for painting and gluing. The coating makes it possible to avoid different surface-preparation operations such as for steel sheets for thermal treatment not having any coating.

[00106] The steel sheet can be pre-coated by dipping, after pickling, in an aluminum bath containing for example only aluminum or either aluminum and from 8% to 11% silicon and 2% to 4% iron, or only from 2% to 4% iron, or even in an aluminum bath preferably containing from 9% to 10% silicon and 2% to 3.5% iron. The aluminum may be aluminum per se or an aluminum alloy.

[00107] In an example of implementation of a coating of the sheet by dipping in a metal bath containing an aluminum alloy comprising a proportion of approximately 90% aluminum, the coating layer comprises a first alloy layer in contact with the surface of the steel. This layer, directly in contact with the surface of the sheet, is highly alloyed with iron.

[00108] A second coating layer, on top of the first, contains approximately 90% aluminum and may contain silicon and a small amount of iron, depending on the composition of the bath.

[00109] The first alloy layer may crack when the sheet is submitted to high strains during cold forming operations of the manufacture of parts.

[00110] [0110]

[00111] According to the invention, after the forming of the part, the coating is subjected to an increase in temperature at a speed in excess of 4° C./second. This rise in temperature makes possible a rapid remelting of the aluminum which fills in the cracks generated by the operation of shaping of the part.

[00112] At the time of thermal treatment, the base coating, of aluminum for example, is transformed into a layer alloyed with iron and comprising different phases depending on the thermal treatment and having a considerable hardness which may exceed 600 HV50 g.

[00113] Another advantage of the invention lies in the fact that the diffusion of the iron in the coating is initiated at high temperature. One thus will have a better cohesion between coating and steel in the sheet. In another form of the invention, the thermal treatment may be performed locally, in heavily deformed zones.

[00114] According to the invention, the sheet, in the delivery state in a coil or in a is sheet, the thickness of which may range between 0.25 mm and 15 mm, has good forming properties and a good resistance to corrosion as well as a good capacity for painting or gluing. Preferably, the steel sheet or blank has a thickness less than 3 mm, since the cooling rates that may be achieved after quenching are high and help to obtain martensitic structures.

[00115] The steel sheet, a coated product, has a substantial resistance to corrosion in the delivery state, during forming and thermal treatments as well as during usage of the finished part. The

presence of the coating at the time of thermal treatment of the parts makes it possible to prevent any decarburization of the base metal as well as any oxidation. That is an undeniable advantage, in particular in the case of hot forming. Furthermore, heating of the treated part does not require a furnace having a controlled atmosphere to prevent a decarburization.

[00116] Thermal treatment of the metal in the sheet comprising heating at a temperature ranging between Ac1, starting temperature of austenitic transformation when heating, for example 750° C. and 1200° C., in a furnace, for a period which depends on the temperature to be reached and the thickness of the blank. The composition is optimized so as to limit the grain growth at the time of thermal treatment. If the structure sought is completely martensitic, the holding temperature should be in excess of Ac3, for example 840° C., temperature of complete austenitic transformation. The temperature holding should be followed by a cooling adjusted to the final structure sought.

[00117] Blanks are thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the introduction in the stamping press is more 10 seconds, a partial transformation from austenite is susceptible to appear: if obtaining a full martensitic structure is desired, the transfer time between the exit of the furnace and stamping should be less than 10 s.

[00118] The inventors have also discovered that the obtaining of a fully martensitic structure is linked to the amount of deformation in the hot forming operation: the amount of local deformation caused by hot forming is closely linked to the shape of the part or product and may exceed locally 40 or 50% in some particular regions. The inventors found that, when the local strain exceeds a critical value of 10%, the cooling rate must be sufficiently high in order to get a total martensitic transformation. Otherwise, bainitic transformation can take place at a significant amount instead of martensitic transformation. Thus, the risk is that heterogeneous structure appears on parts with complex shape where some locations are much more deformed than others. In this respect, the inventors put into evidence that, on the locations of the parts where the forming strain is higher than 10%, the cooling rate must be increased beyond 50° C. is in order to guarantee full martensitic transformation. The cooling rate is defined as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[00119] But one may also seek to obtain ferrite-bainitic or ferrito-martensitic structures, by a heating at a temperature ranging between Ac1, for example 750° C. and Ac3, for example 840° C., followed by an appropriate cooling. According to the level of resistance to be achieved and the thermal treatment applied, one or several of these constituents is/are present in variable proportions.

[00120] The modulation of thermal treatment parameters makes it possible to achieve, with a given composition, different levels of hot and cold sheet resistance according to the thickness sought. For the highest resistance levels, the structure is composed predominantly of martensite.

[00121] The steel is particularly suited to the production of structural and anti-intrusion parts.

[00122] The invention thus enables one to produce a hot- or cold-rolled steel sheet of a desired thickness, coated, and affording extensive forming possibilities and which, after thermal treatment performed on the finished part, makes it possible to obtain a mechanical resistance in excess of 1000 MPa, a substantial resistance to shocks, fatigue, abrasion and wear, while retaining a good resistance to corrosion as well as a good capacity for welding, painting and gluing.

[00123] The present invention is described by way of certain exemplary embodiments which are not intended to be limiting.

EXAMPLES

Example 1

[00124] In a first example of implementation, a cold rolled steel sheet, 1.9 mm thick, containing by weight 0.23% carbon, 1.25% manganese, 0.017% phosphorus, 0.002% sulfur, 0.27% silicon, 0.062% aluminum, 0.021% copper, 0.019% nickel, 0.208% chromium, 0.005% nitrogen, 0.038% titanium, 0.004% boron, 0.003% calcium-has been pre-coated with an aluminum-based alloy with composition 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable impurities. According to the conditions of fabrication, namely the settings of the blowing devices on the operating line, sheets of 120 m long and 650 mm wide with various thickness ranges were produced.

[00125] Sheet A (according to the invention): The thickness t_p1 and t_p2 on each side of the sheet was controlled to be within the range (20-33) micrometers, at every location of the two faces of the sheet, both in the longitudinal (or rolling) direction and in the transversal direction. Measurement was performed continuously with thickness gages devices relying on X-Ray emission. At every moment, the spot of measurement of each gage was a circular zone of about 20 mm radius. The sheets were afterwards cut into blanks of 1.2.times.0.5 m.sup.2 of overall dimensions.

[00126] Sheet B (reference): On these sheets, the pre-coating thickness had a wider variability since the thickness tp1 and tp2 on the two sides of the sheet was comprised in the range (30-45) micrometers. Blanks cut out of these sheets exhibit the same pre-coating thickness.

[00127] The blanks were then submitted to heating in a furnace at T=920° C. Heating time was 3 min, with 4 mn holding time. The microstructure is then fully austenitic. Blanks were thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the transfer in the stamping press is more 10 seconds, a partial transformation from austenite was susceptible to appear, thus reducing the mechanical resistance of the stamped part.

[00128] The blanks were directly cooled afterwards without hot stamping in order to appreciate the eventual remelting of the coating. On series A, no melting of the pre-coating was found. Intermetallic alloying between the pre-coating and the steel substrate occurred completely. On series B, the pre-coating underwent mainly alloying, but some traces of remelting were found, particularly on the former thicker locations of the pre-coating. This partial remelting of the aluminium pre-coating contributes to the progressive fouling of the rollers in the furnace. The sheets according to the invention do not contribute to this progressive buildup on the rollers.

Example 2

[00129] i) Conditions according to the invention: In a second example of implementation, a cold rolled steel sheet, 1.2 mm thick, 120 m long and 650 mm wide, with same composition and same pre-coating as in example 1, has been fabricated. The sheets were afterwards cut into blanks which were heated at 920° C. for 6 mn, this time including the heating phase and the holding

time. Heating rate V_c between 20 and 700° C. was 10° C./s. The blanks were finally hot stamped and quenched in order to obtain full martensitic structures. The parts obtained after hot-stamping are covered by a coating, 40 micrometers thick, illustrated at FIG. 1, which has a four layer structure. Starting from the steel substrate, the layers are the following:

[00130] (a) Interdiffusion layer or intermetallic layer, 17 micrometers thick. This layer is itself composed of two sub-layers. Hardness HV50g ranges from 295 to 407, and the mean composition is: 90% Fe, 7% Al, 3% Si.

[00131] (b) Intermediate layer, appearing darker, 8 micrometers thick. This layer has a hardness of 940HV50g and a mean composition, by weight: 43% Fe, 57% Al, 1% Si.

[00132] (c) Intermetallic layer appearing as a pale phase, 8 micrometers thick, displaying a hardness of 610HV50g, a mean composition of 65% Fe, 31% Al, 4% Si

[00133] (d) Darker superficial layer, 7 micrometers thick, 950 HV50g, with a mean composition of 45% Fe, 54% Al, 1% Si. Layers (c) and (d) are quasi-continuous, i.e. occupying at least 90% of the level corresponding to the considered layer. In particular, layer (c) does not reach the extreme surface except very exceptionally. Anyway, this layer (c) occupies less than 10% of the extreme surface. ii) Conditions of reference: On the other hand, blanks with the same base material and pre-coating parts were furnace-heated in different conditions: The blanks were heated to 950° C. for 7 minutes, this time including the heating phase. Heating rate Vc was 11° C./s. These conditions correspond to a degree of alloying which is more important than in conditions (i).

[00134] In this coating, the pale intermetallic layer (c), is not continuous and appears as to be scattered within the coating. About 50% of this layer is present at the extreme surface of the part. Moreover, the interdiffusion layer, 10 micrometers thick in contact with the steel substrate is thinner than in the previous case of FIG. 1.

[00135] Resistance spot welding was performed in the two situations i) and ii):

[00136] (i): Coating with quasi-continuous layers (c) and (d), layer (c) occupying less than 10% of the extreme surface

[00137] (ii): Coating with mixed and discontinuous layers, layer (c) occupying more than 10% of the extreme surface. Resistance spot welding was performed by superposing two parts and joining them in the following conditions:

[00138] Squeeze force and welding force: 4000 N

[00139] Squeeze time: 50 periods

[00140] Welding and holding time: 18 periods respectively. In each condition, the suitable intensity range was determined for obtaining:

[00141] No sputter during welding

[00142] Acceptable nugget size. For the condition i), the weldability range, expressed in terms of current intensity, is 1.4 kA. For the condition ii) the weldability range is extremely small.

[00143] Thus, it may be seen that the coating according to the invention, yields much more satisfactory results.

Example 3

[00144] In a third example of implementation, a cold rolled steel sheet of the example 1 was cut into blanks of 500.times.500 mm.sup.2 which were heated at 920° C., during 6 mn, then hot stamped and cooled in tools, in such conditions that two different cooling rates were obtained:

[00145] (A): Cooling rate: VA=30° C./s

[00146] (B): Cooling rate: VB=60° C./s Due to the shape of the parts, different deformation levels .epsilon. were created during hot stamping. In particular, some zones largely strained display deformation levels higher than 30%.

[00147] As illustrated on FIG. 3, metallographic observations reveal that when .epsilon.>10%, partial bainitic or ferritic transformation occurs on parts cooled with VA=30° C./s, mainly on former austenitic grain boundaries. On the other hand, the parts cooled with VB=60° C./s display fully martensitic microstructure as illustrated on FIG. 4. The latter structures display superior mechanic resistance and a great homogeneity in the case of mechanical solicitation. Thus, even

in products or parts where straining is larger than 10%, the application of cooling according to the invention guarantees a microstructural and mechanical homogeneity.

Example 4

[00148] In a fourth example of implementation, steel castings containing different values of sulfur, were elaborated. These steels were further hot rolled, then cold rolled steel into sheets, 2.2 mm thick. Sulfur content varies from 11 ppm (0.0011%) to 59 ppm (0.006%) in weight. Apart sulfur, the compositions of these different steel castings comprise in weight: 0.24% carbon, 1.17% manganese, 0.01% phosphorus, 0.25% silicon, 0.045% aluminum, 0.01% copper, 0.02% nickel, 0.2% chromium, 0.04% titanium, 0.003% boron, 0.002% calcium, the remainder being iron and unavoidable impurities. These sheets were pre-coated with an aluminum-based alloy of composition comprising 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable impurities. The sheets were afterwards cut into blanks which were heated at 950° C. for 5 mn, then hot stamped and cooled in tools in order to obtain a full martensitic structure. Mechanical resistance exceeded 1450 MPa. Specimens were extracted according to the transverse sense of rolling direction and submitted to a bending test with alternate bending modes. The inventors put into evidence that the critical bending angle (angle at fracture) is closely related to the sulfur content of the steel: when sulfur content is lower than 0.002%, the bending angle exceeds 60°, which indicates higher ductility and energy absorption. Compact Tensile-Test type specimens were also extracted according to the transverse rolling direction in order to measure the resistance to tearing, i.e. the energy which is necessary for the initiation or propagation of an existing crack. The results, illustrated on FIG. 6, indicate that a initiation energy higher than 18 Joules is achieved when sulfur content is lower than 0.002% in weight. As these qualities of high resistance, high energy absorption and weldability are required in automobile industry, the parts or products fabricated according to the invention will be used with profit for such applications.

[00149] While the above description is clear with regard to the understanding of the invention, the following terms as used in the following list of preferred embodiments and claims have the following noted meanings in order to avoid any confusion:

[00150] pre-coating—the material (Al or Al alloy) coated on or located on at least a portion of the strip or sheet, etc., of base steel to form a pre-coating/base composite, the composite not having been subjected to an alliation reaction between the coated Al or Al alloy material and base steel

[00151] alliation—a reaction between the pre-coating and base steel, to produce at least one intermediate layer different in composition from both the base steel and the pre-coating. The alliation reaction happens during the heat treatment immediately preceding hot stamping. The alliation reaction affects the total thickness of the pre-coating. In a highly preferred embodiment the alliation reaction forms the following layers: (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial as described above;

[00152] pre-coated steel—the pre-coating/base composite, not having been subjected to an alliation reaction between the coated material and base steel;

[00153] coating—the pre-coating after having been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coating comprises layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[00154] coated steel or product—the pre-coated steel or product that has been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coated steel is a strip or sheet, etc., of base steel having thereon an invention coating comprising layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[00155] blank—a shape cut from a strip.

[00156] product—a stamped blank

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	Document Description	**Start**	**End**
	Response to Election / Restriction Filed	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	2
	Claims	3	7
	Applicant Arguments/Remarks Made in an Amendment	8	8

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2	Specification	206311028CON7FiledSubSpecMarked15sep21-0001.PDF	145141	no	23
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors:	Drillet et al.	Application No.:	17/319,306
Filing Date:	May 13, 2021	Confirmation No.:	1093
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Art Unit:	1784	Customer No.:	23280
Title:	COATED STEEL STRIPS, COATED STAMPED PRODUCTS AND METHODS		

Submitted Electronically via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

September 15, 2021

RESPONSE TO RESTRICTION REQUIREMENT

Sir:

This letter is in response to the Restriction Requirement dated July 23, 2021. Please amend the above-identified application as follows:

REMARKS

The Examiner has restricted the present application into the following inventions:

I. Claims 25-49, drawn to a hot stamped coated steel product, classified in B32B 15/012; and

II. Claims 50-54, drawn to a method of forming a hot stamped coated steel product, classified in C21D 9/46.

Applicants hereby elect group I, claims 25 to 49. Claims 50 to 54 have accordingly been canceled and will be pursued in a divisional application.

If any fee is required at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Reconsideration and allowance of the present application is respectfully requested.

Respectfully Submitted,
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Amendments to the Specification

Amendments to the specification and abstract have been made in the substitute specification enclosed herewith to address typographical errors, and such that the priority information is accurate and corresponds with the Application Data Sheet. A marked-up copy of the substitute specification in addition to a clean copy of the substitute specification is enclosed. No new matter has been added.

AMENDMENTS TO THE CLAIMS:

The following listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claims 1-24 (canceled).

Claim 25 (Previously presented) A hot stamped coated steel product, which comprises:

(a) a strip of base steel having a first side and a second side; and

(b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel, wherein:

(i) said coating results from interdiffusion between said base steel and an aluminum or aluminum alloy pre-coating, and

(ii) wherein said coating comprises, proceeding from the base steel outwards:

(a) an Interdiffusion layer,

(b) an Intermediate layer,

(c) an Intermetallic layer, and

(d) a Superficial layer,

wherein layers (a), (b), (c), and (d) each have a different mean composition from one another,

wherein said coating of the hot stamped coated steel product has a thickness greater than 30 micrometers.

Claim 26 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 27 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has an HV50g hardness between 290 and 410; layer (b) has an HV50g hardness between 900 and 1000, +/-10%; layer (c) has an HV50g hardness

between 580 and 650, +/-10%; and layer (d) has an HV50g harness between 900 and 1000, +/-10%.

Claim 28 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 17 micrometers or less.

Claim 29 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 15 micrometers or less.

Claim 30 (Previously presented) The hot stamped coated steel product according to claim 28, wherein the coating is 40 micrometers thick.

Claim 31 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the interdiffusion layer has a first mean iron composition, the intermediate layer has a second mean iron composition less than the first mean iron composition; wherein the intermetallic layer has a third mean iron composition, the third mean iron composition less than the first mean iron composition and greater than the second mean iron composition, and the superficial layer has a fourth mean iron composition, the fourth mean iron composition begin less than the third mean iron composition.

Claim 32 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (b).

Claim 33 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (c).

Claim 34 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (d).

Claim 35 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness: that is greater than a thickness of layer (b); that is greater than a thickness of layer (c); and that is greater than a thickness of layer (d).

Claim 36 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (b).

Claim 37 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (c).

Claim 38 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (d).

Claim 39 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product is fully martensitic.

Claim 40 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:

0.15%<carbon<0.5%;

0.5%<manganese<3%;

0.1%<silicon<0.5%;

0.01%<chromium<1%;

titanium<0.2%;

aluminum<0.1%;

phosphorus<0.1%;

sulfur<0.05%;

0.0005%<boron<0.08%;

a remainder being iron and impurities inherent in processing.

Claim 41 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:

0.15%<carbon<0.25%,

0.8%<manganese<1.8%,

0.1%<silicon<0.35%,

0.01%<chromium<0.5%,

titanium<0.1%

aluminum<0.1%

phosphorus<0.1%

sulfur<0.05%

0.002%<boron<0.005%,

a remainder being iron and impurities inherent in processing.

Claim 42 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Interdiffusion layer comprises the following components by weight based on total weight: 86 to 95% Fe, 4 to10% Al, and 0 to 5% Si.

Claim 43 (Previously presented) The hot stamped coated steel product according to claim 42, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 44 (Previously presented) The hot stamped coated steel product according to claim 43, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 45 (Previously presented) The hot stamped coated steel product according to claim 44, wherein the Superficial layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53to 61% Al, and 0 to 2% Si, and wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 46 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 47 (Previously presented) The hot stamped coated steel product according to claim 46, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 48 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1000 MPa.

Claim 49 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1500 MPa.

Claims 50 to 54 (Canceled).

THERMALLY CONTROL INTEGRATED HIGH RATE RECHARGING STATION COMBINED WITH DATA CENTER AND NETWORKING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This is a Continuation of U.S. Patent Application No. ~~16/413,799~~ 16/413,825 filed May 16, 2019, now U.S. Patent No. 11,041,226, which is a Continuation of U.S. Patent Application No. 15/606,770 filed May 26, 2017, now U.S. Patent No. 10,550,447, which is a Continuation of U.S. Patent Application No. 13/621,015, filed September 15, 2012, now U.S. Patent 9,708,683, which is a Divisional of U.S. Patent Application No. 12/447,777, filed April 29, 2009, now U.S. Patent No. 8,307,680, which is a National Phase Application of International Patent Application PCT/IB06/004019, filed October 30, 2006. All of the above patent applications are hereby incorporated by reference herein.

[0002] The present invention relates to, among other things, coated steels, methods of making such coated steels, including hot dipping, methods of using such coated steels, stamping blanks prepared from coated steels, stamped products prepared from coated steels, and to various uses of the invention products such as in spot welding, etc.

[0003] Additional advantages and other features of the present invention will be set forth in part in the description that follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from the practice of the present invention. The advantages of the present invention may be realized and obtained as particularly pointed out in the appended claims. As will be realized, the present invention is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the present invention. The description is to be regarded as illustrative in nature, and not as restrictive.

BACKGROUND OF THE INVENTION

[0004] In recent years the use of pre-coated steels in hot-stamping processes for the shaping of parts has become important, especially in the automotive industry. Fabrication of such parts may include the following main steps:

[0005] Pre-coating of a steel sheets, by hot dipping;

[0006] Trimming or cutting for obtaining blanks;

[0007] Heating the blanks in order to obtain alloying of the steel substrate with the pre-coating, as well as the austenitizing of the steel; and

[0008] Hot forming followed by rapid cooling of the part in order to obtain predominantly martensitic structures, See for Example U.S. Pat. No. 6,296,805, incorporated herein by reference.

[0009] Thanks to an alloying of the pre-coating with the steel substrate, which has the effect of creating intermetallic alloys with high melting temperature, the blanks having such coating may be heated in a temperature range where austenitizing of the metallic substrate takes place, allowing further hardening by quenching.

[0010] Heat treatments of the blanks in view of the intermetallic alloying of the coating and austenitizing of the substrate are most frequently performed in furnaces, where blanks are traveling on rollers. The thermal cycles experienced by the blanks include first a heating phase whose rate is a function of parameters such as blank thickness, furnace temperature, traveling speed, and coating reflectivity. After this heating phase, thermal cycles generally include a holding phase, whose temperature is the regulation temperature of the furnace. Problems however are experienced with the furnace operation: the rollers may become fouled by metallic deposits which come from the pre-coating of the blanks. If these deposits are excessive, maintenance of the rollers has to be performed and productivity is decreased.

[0011] Parts obtained after heating and rapid cooling display very high mechanical resistance and may be used for structural applications, for example for automotive industry applications. These parts must be frequently welded with others and high weldability is required. This means that:

[0012] The welding operation should be performable in a sufficiently wide operating range in order to guarantee that an eventual drift of the nominal welding parameters has no incidence on weld quality. For resistance welding, which is very common in the automotive industry, an

operating welding range is defined by the combination of parameters: welding current intensity and force F applied of the parts during welding being among the most important. A proper combination of these parameters helps to ensure that insufficient nugget diameter is not obtained (caused by too low intensity or too low force) and that no weld expulsion occurs.

[0013] The welding operation should also be performed in such a way that high mechanical resistance is obtained on the weld. This mechanical resistance may be evaluated by tests such as by shear-tensile tests or cross-tensile tests.

SUMMARY OF THE INVENTION

[0014] There remains a need for coated steels which may be conveniently used to prepare shaped parts by a stamping process. There also remains a need for coated steels which may be used to prepare shaped parts by a stamping process which are suitable for welding. There also remains a need for processes for preparing such coated steels and stamped parts.

[0015] The inventors have discovered that certain coated steels in which a base steel strip is at least partially coated (sometimes termed "pre-coated," this prefix indicating that a transformation of the nature of the pre-coating will take place during heat treatment before stamping) on at least one side with a coating of either aluminum or an aluminum alloy and in which the coating has a defined thickness and is preferably substantially uniform, are conveniently formed into shaped parts after heating by stamping and are conveniently welded. In addition, the inventors have discovered that the roller fouling problem described above generally arises from an insufficient degree of intermetallic alloying between the substrate and the metallic pre-coating. Furthermore, it was discovered that the location of the fouling of the rollers corresponds to zones of the blanks in contact with the rollers where the metallic pre-coating thickness locally exceeds the average thickness. While not bound by a particular theory, it is believed that if a pre-coating is locally too thick, intermetallic alloying is insufficient and the pre-coating melts, fouling the rollers. Thus, the inventors have discovered that the control of the homogeneity of the pre-coating thickness over the entire sheet within given tolerances is an important factor for obtaining the desired degree of intermetallic alloying, allowing one to improve the resistance to the subsequent melting of the coating during travel on rollers.

[0016] The inventors have also discovered that particularly good weldability of aluminized and hot stamped parts is associated with a special succession of coating layers on the parts, proceeding from steel substrate outwards.

[0017] The inventors have also discovered that a specific combination of transfer time between the heating furnace and the stamping die, the amount of deformation during stamping, the temperature of stamping, the cooling rate of the product during stamping, leads to the fabrication of a part with a fully homogeneous martensitic structure and that an increase in ductility or energy absorption of the parts after stamping is obtained by a reduction of sulfur below a critical value, these two benefits being obtained with or without the invention aluminum/aluminum alloy coating, and with other coatings.

[0018] Accordingly, and in view of the above, it is one object of the present invention to provide novel pre-coated steels strips which may be conveniently processed into stamping blanks.

[0019] It is another object of the present invention to provide novel pre-coated steels strips or sheets which may be conveniently formed into parts by stamping.

[0020] It is another object of the present invention to provide novel coated steels which may be conveniently formed into parts by hot stamping.

[0021] It is another object of the present invention to provide novel methods for making such a coated steel.

[0022] It is another object of the present invention to provide novel stamping blanks which are prepared from such a coated steel.

[0023] It is another object of the present invention to provide novel methods of making such stamping blanks.

[0024] It is another object of the present invention to provide novel stamped parts which are prepared from such a coated steel.

[0025] It is another object of the present invention to provide novel methods of making such stamped parts.

[0026] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such stamped parts.

[0027] It is another object of the present invention to provide novel stamped parts.

[0028] It is another object of the present invention to provide novel methods of making welded stamped parts.

[0029] It is another object of the present invention to provide novel articles of manufacture, such as a motor vehicle, which contain such welded stamped parts.

[0030] It is another object of the present invention to provide novel welded coated steels and welded stamping blanks.

[0031] It is another object of the present invention to provide novel methods of making such welded coated steels and welded stamping blanks.

[0032] These and other objects, which will become apparent during the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] FIG. 1 illustrates a preferred embodiment of an invention coated part, after heat treatment and stamping. The succession of layers of the coating on the steel substrate is: (a) interdiffusion layer; (b) intermediate layer; (c) Intermetallic layer; and (d) superficial layer. This arrangement is particularly favorable for the further welding of the part.

[0034] FIG. 2 illustrates a coating of a steel substrate after heat treatment and stamping which does not correspond to the invention. This succession of layers (interdiffusion layer and intermetallic layer) yields inferior results in resistance spot welding.

[0035] FIG. 3 illustrates a microstructure of a steel part, hot stamped and cooled under conditions not according to the invention.

[0036] FIG. 4 illustrates the microstructure of a steel part, hot stamped and cooled according to a preferred set of conditions according to the invention.

[0037] FIG. 5 illustrates the influence of sulfur on the bending angle of parts after hot stamping.

[0038] FIG. 6 illustrates the influence of sulfur on the initiation energy of fracture of parts after hot stamping.

[0039] FIG. 7 shows conditions of furnace temperature as a function of the total dwell time in the furnace for sheets of total thicknesses of from 0.7-1.5 and 1.5-3 mm that provide particularly favorable coatings for welding.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0040] As noted above, the inventors' discovery that certain coated steels, in which a base steel is at least partially pre-coated on at least one side with a coating of either aluminum or an aluminum alloy and in which the pre-coating has a defined thickness and is substantially uniform, are conveniently formed into shaped parts by stamping, forms one basis for the invention.

[0041] In the context of the present invention, the terms first side (or side 1) and second side (or side 2) of the strip or sheet, etc., of base steel refer to the two large, opposite-facing, surfaces which have a surface area defined by the length and width of the strip of base steel. In contrast, the side edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the length and thickness of the strip. The top and bottom edges of the strip of base steel are the two small, opposite-facing, surfaces which have a surface area defined by the width and thickness of the strip. In the following, t_p designates the thickness of the pre-coating, at any considered location on the sides 1 and 2 of a sheet or a blank. In particular, in the case of sheets coated on two sides 1 and 2, t_p1 stands for the thickness on side 1, and t_p2 for the thickness on side 2.

[0042] According to a highly preferred embodiment t_p is controlled in a precise range, expressed by (t_{pmin}, t_{pmax}) in order to improve the resistance to the fouling of the rollers. The thickness is preferably controlled, both in the longitudinal (or rolling) direction of the strip or sheet, as well in the transverse direction.

[0043] In relation to the problem of the fouling of rollers, the control of the pre-coating thickness on the side of the sheet or blank which is directly in contact with the rollers is especially important. Because different operations can follow the step of coating the steel sheet (for example hot-dip-coating which provides coated sides 1 and 2), it is preferable to carefully control the pre-coating on both sides of the sheet. For example, after any of coiling, handling, cutting, punching, etc., sides 1 and 2 may be not readily identifiable. But when control of tp is effected on the two sides of the sheet that has been coated (first side and second side) it is not necessary to track sides 1 and 2 as neither side will foul the roller. In addition, it is not necessary to trim the sheet in order to obtain a preferred smaller sheet having a more uniform homogeneity of pre-coating thickness, thus providing a sheet that is pre-coated by, e.g., hot-dipping. In other words, important benefits are obtained when one controls the pre-coating minimum and maximum thickness of the first side (t_{pmin1}, t_{pmax1}) and the pre-coating minimum and maximum thickness of the second side (t_{pmin2}, t_{pmax2}) of the subject steel sheet or blank.

[0044] Hot-dip coated steels are the preferred steels herein. However, regardless of the coating method, the pre-coating thickness on one or both sides of the sheet can be measured and monitored continuously on a coating line directly after the coating operation. This may be realized by devices known per se, such as thickness gages relying on X-Ray absorption. At every moment, the measurement of thickness at a given location may be performed for example on an area of a few hundreds of mm.sup.2, this representing the dimension of the zone irradiated by X-Ray.

[0045] In a preferred embodiment, a plurality of such devices are positioned at different distances in the transverse direction of the strip in order to obtain a profile of the thickness of the pre-coating along the strip width.

[0046] The inventors have discovered that the resistance to the pollution or fouling of the rollers in the furnaces is improved when the minimum and maximum thickness respectively of at least one of the first side (t_{pmin1}, t_{pmax1}) and the second side (t_{pmin2}, t_{pmax2}) are respectively equal to 20 and 33 micrometers (a micrometer is the same as a micron and is a metric unit of length equal to one millionth of a meter). In other words, in a preferred embodiment, at every location on at least one face of the sheet or the blank, the thickness t_p of the pre-coating is preferably from 20-33

micrometers in thickness, including 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 and 32 micrometers and all ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 22.34 micrometers). For hot-dip coating, precise control of this range of pre-coating thickness can be realized on an operating line for example using a system of nozzles blowing gas after coating, for example after exit of the strip or sheet from a bath, and by the flatness of the strip. Number, geometry and location of the nozzles, and flow rates are among the main parameters for a precise control of the thickness t_p. Given the present disclosure, one of ordinary skill in this art can control the pre-coating thickness as described herein without undue labor.

[0047] The invention refers to strips produced in industrial conditions, i.e. where control of pre-coating thickness is effective over a wide surface strip, i.e. with a length greater than 100 m, and with a width greater than 600 mm. In such a way, blanks cut or trimmed out these strips display very high homogeneity of pre-coating thickness, and the settings of the heating treatments in the furnace do not have to be changed for being adapted to eventual variations of this thickness.

[0048] While not bound by a particular theory of operation, the inventors believe that several of the benefits of the invention are related to this pre-coating thickness range, such as the following:

[0049] For a pre-coating thickness less than 20 micrometers, the alloyed layer which is formed during the heating of the blank has an insufficient roughness. Thus, the adhesion of subsequent painting is low on this surface, and the corrosion resistance is decreased.

[0050] If the pre-coating thickness is more than 33 micrometers at a given location on a sheet, the risk is that the difference of thickness between this location and some other locations where the pre-coating is thinner, becomes too important: The settings of the heating treatment in the furnace may be adapted to the thinner value of the pre-coating, but not to the thicker one. Thus, the alloying reaction forming the intermetallic alloy may take place to an insufficient degree since the mean diffusion distance of the elements in the pre-coating becomes significantly less than the local value of the pre-coating thickness. As a matter of results, alloying will become much more difficult in the external (or superficial) part, particularly in the case of high heating rate.

[0051] Thus, in a first embodiment, the present invention provides certain coated steel strips, which comprise a strip of base steel and a pre-coating of aluminum or an aluminum alloy on at least a part of one side of the strip of the base steel. For many applications, the strip of base steel may comprise any type of steel which may be coated with either aluminum or an aluminum alloy. However, for certain applications, such as a structural part of an automobile, it is preferred that the strip of base steel comprise an ultra high strength steel (UHSS). In such cases, it is particularly preferred that the strip of base steel comprises a boron steel.

[0052] The inventors have also discovered that good welding results are achieved if the coating obtained on parts made out of blanks having undergone intermetallic alloying, austenitizing and hot stamping, displays distinctive features. It must be pointed out that this coating is different from the initial pre-coating, since the thermal treatment causes an alloying reaction with the steel substrate which modifies both the physico-chemical nature and the geometry of the pre-coating: in this regard, the inventors have discovered that particularly good weldability of aluminized and hot stamped parts is associated with the following succession of coating layers on the parts, proceeding from steel substrate outwards:

[0053] (a) Interdiffusion layer,

[0054] (b) Intermediate layer,

[0055] (c) Intermetallic layer,

[0056] (d) Superficial layer See, e.g., FIG. 1. In a preferred embodiment these layers are as follows:

[0057] (a) Interdiffusion layer, preferably with medium hardness (e.g., HV50g between 290 and 410, HV50g designating the hardness measured under a load of 50 grams) In a preferred embodiment this layer has the following composition, by weight: 86-95% Fe, 4-10% Al, 0-5% Si

[0058] (b) Intermediate layer (HV50g around 900-1000 e.g., +/−10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% Si

[0059] (c) Intermetallic layer, with hardness HV50g around 580-650, e.g., +/−10%) In a preferred embodiment this layer has the following composition, by weight: 62-67% Fe, 30-34% Al, 2-6% Si

[0060] (d) Superficial layer (HV50g around 900-1000 e.g., +/−10%)) In a preferred embodiment this layer has the following composition, by weight: 39-47% Fe, 53-61% Al, 0-2% In a preferred embodiment the total thickness of layers (a) to (d) is greater than 30 micrometers. In another preferred embodiment, the thickness of layer (a) is less than 15 micrometers, for example 14, 12, 8, 6, 4, 2, or 1 micrometers, and all whole numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 13.84 micrometers

[0061] The inventors have discovered that high weldability is especially obtained when layers (c) and (d) are essentially continuous (i.e.: occupying at least 90% of the level corresponding to the considered layer) and when less than 10% of layer (c) is present at the extreme surface of the part. Without being bound by a theory, it is thought that this particular layer disposal, in particular layer (a) and, layers (c) and (d) influence the resistivity of the coating both by their intrinsic characteristics and by the effect of roughness. Thus, current flow, heat generation at the surfaces, and nugget formation in the initial stage of spot welding are affected by this particular arrangement. This favorable layer disposition is obtained for example when aluminum- or aluminum alloy pre-coated steel sheets, whose thickness range from, e.g., 0.7 to 3 mm, are heated for 3 to 13 minutes (this dwell time includes the heating phase and the holding time) in a furnace heated to a temperature of 880 to 940° C. Other conditions leading to such favorable layer dispositions are found in FIG. 7:

[0062] For sheets of total thicknesses greater or equal to 0.7 mm, and less than or equal to 1.5 mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by conditions lying within the limits of diagram "$ABCD_2$" For sheets of total thicknesses greater than 1.5 mm, and less than or equal to 3 mm, the preferred treatment conditions: (furnace temperature, total dwell time in the furnace) are illustrated in FIG. 7 by diagram "EFGH". The heating rate V_c is comprised between 4 and 12° C./s for producing a favorable alloyed layer disposition. In this regard, this "heating rate" reflects the temperature rise

which is experienced by the pre-coated steel upon being located in the preheated furnace. V_c is defined as the mean heating rate between 20 and 700° C. The inventors have discovered that the control of V_c in this precise range is a key factor, because it controls directly the nature and the morphology of the alloyed layers which are formed. It is here underlined that the heating rate V_c is different from the mean heating rate, which is the heating rate between room temperature and furnace temperature. The rates of 6, 7, 8, 9, 10, and 11° C./s are included as are all numbers, ranges and subranges therebetween, and including all numbers between each listed value as if written out in its entirety (e.g., 7.7° C./s). In this regard, all of the conditions specified within FIG. 7 are incorporated herein by reference thereto. Particularly preferred conditions are:

[0063] (for thicknesses of 0.7-1.5 mm)

[0064] 930° C., from 3 minutes up to 6 minutes;

[0065] 880° C., from 4 minutes 30 seconds up to 13 minutes (for thicknesses of 1.5 to 3 mm)

[0066] 940° C., from 4 minutes up to 8 minutes;

[0067] 900° C., from 6 minutes 30 seconds up to 13 minutes.

[0068] A special advantage arises from pre-coatings whose thickness is comprised between 20 and 33 micrometers, since this thickness range yields favorable layer disposal, and since the homogeneity of the pre-coating thickness is associated to an homogeneity of the coating formed after alliation treatment.

[0069] Heated blanks are thereafter transferred to a die, hot stamped to obtain a part or product, and cooled at a rate of more than 30.degree.C./s, The cooling rate is defined here as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[0070] The strip of base steel is coated with either aluminum or an aluminum alloy. Commercially pure aluminum is known in the art as Type 2 aluminum, while alloys of aluminum with 5 to 11% by weight of silicon are known in the art as Type 1 aluminum. Silicon is present in order to prevent the formation of a thick iron-metallic intermetallic layer which reduces adherence and formability. Other alloying elements useful with aluminum herein include iron,

between 2.5 and 3% by weight, and calcium, between 15 and 30 ppm by weight, including combinations of two or more thereof with aluminum.

[0071] A typical metal bath for an Al—Si coating generally contains in its basic composition by weight, from 8% to 11% silicon, from 2% to 4% iron, the remainder being aluminum or aluminum alloy, and impurities inherent in processing. Typical composition of Al—Si coating is: Al—9.3% Si—2.8% Fe. Invention coatings are not limited to these compositions, however.

[0072] The strip of base steel used herein may be any which can be coated by a conventional coating technique. For example, the strip of base steel may be any hot rolled strip, such as those prepared by hot rolling a steel slab (either with or without subsequent cold rolling). Typically, the strip of base steel will be stored and transported in the form of a coil both before and after the formation of the coating.

[0073] An example of a preferred steel for the strip of base steel is one having the following composition by weight:

[0074] 0.10%<carbon<0.5%

[0075] 0.5%<manganese<3%

[0076] 0.1%<silicon<1%

[0077] 0.01%<chromium<1%

[0078] titanium<0.2%

[0079] aluminum<0.1%

[0080] phosphorus<0.1%

[0081] sulfur<0.05%

[0082] 0.0005%<boron<0.010%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing. Use of such a steel provides a very high

mechanical resistance after thermal treatment and the aluminum-based coating provides a high resistance to corrosion.

[0083] Particularly preferably, the composition by weight of the steel in the strip of base steel is the following:

[0084] 0.15%<carbon<0.25%

[0085] 0.8%<manganese<1.8%

[0086] 0.1%<silicon<0.35%

[0087] 0.01%<chromium<0.5%

[0088] titanium<0.1%

[0089] aluminum<0.1%

[0090] phosphorus<0.1%

[0091] sulfur<0.05%

[0092] 0.002%<boron<0.005%, the remainder comprising, consisting essentially of, or consisting of iron and impurities inherent in processing.

[0093] A preferred strip herein is 100 m long and 600 mm wide. Preferred thicknesses are 0.7 to 3 mm.

[0094] Even more preferably, in the composition by weight of the sheet, the weight ratio of titanium content with respect to the nitrogen content is in excess of 3.42, believed to be a level which the boron is no longer able to combine with the nitrogen.

[0095] An example of preferred commercially available steel for use in the strip of base steel is 22MnB5.

[0096] Chromium, manganese, boron and carbon may be added, in the composition of the steel according to the invention, for their effect on hardenability. In addition, carbon makes it possible to achieve high mechanical characteristics thanks to its effect on the hardness of the martensite.

[0097] Aluminum is introduced into the composition, to perform deoxidation in the liquid state and to protect the effectiveness of the boron.

[0098] Titanium, the ratio of the content of which with respect to the nitrogen content should be in excess of 3.42, is introduced for example in order to prevent combining of the boron with the nitrogen, the nitrogen being combined with titanium.

[0099] The alloying elements, Mn, Cr, B, make possible a hardenability allowing hardening in the stamping tools or the use of mild hardening fluids limiting deformation of the parts at the time of thermal treatment. In addition, the composition according to the invention is optimized from the point of view of weldability.

[00100] The steel in the sheet may undergo a treatment for globularization of sulfides performed with calcium, which has the effect of improving the fatigue resistance of the sheet.

[00101] As mentioned above, ultra-high-strength can be provided with the steel sheet coated and hot stamped according to the invention. This high level of strength is sometimes associated with a limited ductility. In applications requiring a higher ductility, in particular when an ability for bending is required from a part or a product, the inventors have discovered that increased ductility can be obtained if sulfur is particularly controlled: when the sulfur level of base steel is lower than or equal to 0.002% (20 ppm), the bending angle can be greater than 60° and enhanced ductility and tearing resistance are obtained on the parts having experienced heat treatment and stamping. Preferred levels include 20, 18, 15, 13, 10, 8, 5, etc ppm sulfur. In fact, this benefit applies to steels in general, and is not limited to coated steels or to steels coated with Al or Al alloy coatings. While not bound by a particular theory, when analyzing causes of premature failure of some parts in bending operations, the inventors observed that failure initiated on sulfide inclusions. It is thus believed that decohesions between inclusions and the martensitic or bainito-martensitic matrix act as stress-concentration factors and trigger further crack propagation in the ductile mode.

[00102] The invention also concerns a process for producing a part starting from an invention coated sheet, then cut into a blank which, after shaping, the coating of the blank is subjected to an increase in temperature at a speed in excess of 4° C./second, but lower than 12° C./second. The heating rate V_c is defined as the mean rate between 20 and 700° C.

[00103] The invention also concerns the use of a hot-rolled steel sheet which then can be cold-rolled and coated, for structural and/or anti-intrusion or substructure parts for a land motor vehicle, such as, for example, a bumper bar, a door reinforcement, a wheel spoke, etc.

[00104] The sheet according to the invention described above can derive, by reason of its processing, from a hot-rolling mill, and possibly may be cold-rerolled again depending on the final thickness desired. It then is coated with an aluminum-based coating, for example by dipping in a bath containing, in addition to the aluminum source/alloy, e.g., from 8% to 11% silicon and from 2% to 4% iron, the sheet having a high mechanical resistance after thermal treatment and a high resistance to corrosion, as well as a good capacity for painting and gluing.

[00105] The coating is preferably controlled as above, and has in particular the function of protecting the basic sheet against corrosion in various conditions. The thermal treatment applied at the time of a hot-forming process or after forming makes it possible to obtain high mechanical characteristics which can exceed 1500 MPa for mechanical resistance and 1200 MPa for yield stress. The final mechanical characteristics are adjustable and depend in particular on the martensite fraction of the structure, on the carbon content of the steel and on the thermal treatment. At the time of thermal treatment performed on a finished part or at the time of a hot-shaping process, the coating forms a layer having a substantial resistance to abrasion, wear, fatigue, shock, as well as a good resistance to corrosion and a good capacity for painting and gluing. The coating makes it possible to avoid different surface-preparation operations such as for steel sheets for thermal treatment not having any coating.

[00106] The steel sheet can be pre-coated by dipping, after pickling, in an aluminum bath containing for example only aluminum or either aluminum and from 8% to 11% silicon and 2% to 4% iron, or only from 2% to 4% iron, or even in an aluminum bath preferably containing from 9% to 10% silicon and 2% to 3.5% iron. The aluminum may be aluminum per se or an aluminum alloy.

[00107] In an example of implementation of a coating of the sheet by dipping in a metal bath containing an aluminum alloy comprising a proportion of approximately 90% aluminum, the coating layer comprises a first alloy layer in contact with the surface of the steel. This layer, directly in contact with the surface of the sheet, is highly alloyed with iron.

[00108] A second coating layer, on top of the first, contains approximately 90% aluminum and may contain silicon and a small amount of iron, depending on the composition of the bath.

[00109] The first alloy layer may crack when the sheet is submitted to high strains during cold forming operations of the manufacture of parts.

[00110] [0110]

[00111] According to the invention, after the forming of the part, the coating is subjected to an increase in temperature at a speed in excess of 4° C./second. This rise in temperature makes possible a rapid remelting of the aluminum which fills in the cracks generated by the operation of shaping of the part.

[00112] At the time of thermal treatment, the base coating, of aluminum for example, is transformed into a layer alloyed with iron and comprising different phases depending on the thermal treatment and having a considerable hardness which may exceed 600 HV50 g.

[00113] Another advantage of the invention lies in the fact that the diffusion of the iron in the coating is initiated at high temperature. One thus will have a better cohesion between coating and steel in the sheet. In another form of the invention, the thermal treatment may be performed locally, in heavily deformed zones.

[00114] According to the invention, the sheet, in the delivery state in a coil or in a is sheet, the thickness of which may range between 0.25 mm and 15 mm, has good forming properties and a good resistance to corrosion as well as a good capacity for painting or gluing. Preferably, the steel sheet or blank has a thickness less than 3 mm, since the cooling rates that may be achieved after quenching are high and help to obtain martensitic structures.

[00115] The steel sheet, a coated product, has a substantial resistance to corrosion in the delivery state, during forming and thermal treatments as well as during usage of the finished part. The

presence of the coating at the time of thermal treatment of the parts makes it possible to prevent any decarburization of the base metal as well as any oxidation. That is an undeniable advantage, in particular in the case of hot forming. Furthermore, heating of the treated part does not require a furnace having a controlled atmosphere to prevent a decarburization.

[00116] Thermal treatment of the metal in the sheet comprising heating at a temperature ranging between Ac1, starting temperature of austenitic transformation when heating, for example 750° C. and 1200° C., in a furnace, for a period which depends on the temperature to be reached and the thickness of the blank. The composition is optimized so as to limit the grain growth at the time of thermal treatment. If the structure sought is completely martensitic, the holding temperature should be in excess of Ac3, for example 840° C., temperature of complete austenitic transformation. The temperature holding should be followed by a cooling adjusted to the final structure sought.

[00117] Blanks are thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the introduction in the stamping press is more 10 seconds, a partial transformation from austenite is susceptible to appear: if obtaining a full martensitic structure is desired, the transfer time between the exit of the furnace and stamping should be less than 10 s.

[00118] The inventors have also discovered that the obtaining of a fully martensitic structure is linked to the amount of deformation in the hot forming operation: the amount of local deformation caused by hot forming is closely linked to the shape of the part or product and may exceed locally 40 or 50% in some particular regions. The inventors found that, when the local strain exceeds a critical value of 10%, the cooling rate must be sufficiently high in order to get a total martensitic transformation. Otherwise, bainitic transformation can take place at a significant amount instead of martensitic transformation. Thus, the risk is that heterogeneous structure appears on parts with complex shape where some locations are much more deformed than others. In this respect, the inventors put into evidence that, on the locations of the parts where the forming strain is higher than 10%, the cooling rate must be increased beyond 50° C. is in order to guarantee full martensitic transformation. The cooling rate is defined as the mean rate between the exit of the heated blank from the furnace, down to 400° C.

[00119] But one may also seek to obtain ferrite-bainitic or ferrito-martensitic structures, by a heating at a temperature ranging between Ac1, for example 750° C. and Ac3, for example 840° C., followed by an appropriate cooling. According to the level of resistance to be achieved and the thermal treatment applied, one or several of these constituents is/are present in variable proportions.

[00120] The modulation of thermal treatment parameters makes it possible to achieve, with a given composition, different levels of hot and cold sheet resistance according to the thickness sought. For the highest resistance levels, the structure is composed predominantly of martensite.

[00121] The steel is particularly suited to the production of structural and anti-intrusion parts.

[00122] The invention thus enables one to produce a hot- or cold-rolled steel sheet of a desired thickness, coated, and affording extensive forming possibilities and which, after thermal treatment performed on the finished part, makes it possible to obtain a mechanical resistance in excess of 1000 MPa, a substantial resistance to shocks, fatigue, abrasion and wear, while retaining a good resistance to corrosion as well as a good capacity for welding, painting and gluing.

[00123] The present invention is described by way of certain exemplary embodiments which are not intended to be limiting.

EXAMPLES

Example 1

[00124] In a first example of implementation, a cold rolled steel sheet, 1.9 mm thick, containing by weight 0.23% carbon, 1.25% manganese, 0.017% phosphorus, 0.002% sulfur, 0.27% silicon, 0.062% aluminum, 0.021% copper, 0.019% nickel, 0.208% chromium, 0.005% nitrogen, 0.038% titanium, 0.004% boron, 0.003% calcium-has been pre-coated with an aluminum-based alloy with composition 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable impurities. According to the conditions of fabrication, namely the settings of the blowing devices on the operating line, sheets of 120 m long and 650 mm wide with various thickness ranges were produced.

[00125] Sheet A (according to the invention): The thickness t_p1 and t_p2 on each side of the sheet was controlled to be within the range (20-33) micrometers, at every location of the two faces of the sheet, both in the longitudinal (or rolling) direction and in the transversal direction. Measurement was performed continuously with thickness gages devices relying on X-Ray emission. At every moment, the spot of measurement of each gage was a circular zone of about 20 mm radius. The sheets were afterwards cut into blanks of 1.2.times.0.5 m.sup.2 of overall dimensions.

[00126] Sheet B (reference): On these sheets, the pre-coating thickness had a wider variability since the thickness tp1 and tp2 on the two sides of the sheet was comprised in the range (30-45) micrometers. Blanks cut out of these sheets exhibit the same pre-coating thickness.

[00127] The blanks were then submitted to heating in a furnace at T=920° C. Heating time was 3 min, with 4 mn holding time. The microstructure is then fully austenitic. Blanks were thereafter transferred from the furnace to a stamping press. When the elapsed time between the exit of the blanks from the furnace and the transfer in the stamping press is more 10 seconds, a partial transformation from austenite was susceptible to appear, thus reducing the mechanical resistance of the stamped part.

[00128] The blanks were directly cooled afterwards without hot stamping in order to appreciate the eventual remelting of the coating, On series A, no melting of the pre-coating was found. Intermetallic alloying between the pre-coating and the steel substrate occurred completely. On series B, the pre-coating underwent mainly alloying, but some traces of remelting were found, particularly on the former thicker locations of the pre-coating. This partial remelting of the aluminium pre-coating contributes to the progressive fouling of the rollers in the furnace. The sheets according to the invention do not contribute to this progressive buildup on the rollers.

Example 2

[00129] i) Conditions according to the invention: In a second example of implementation, a cold rolled steel sheet, 1.2 mm thick, 120 m long and 650 mm wide, with same composition and same pre-coating as in example 1, has been fabricated. The sheets were afterwards cut into blanks which were heated at 920° C. for 6 mn, this time including the heating phase and the holding

time. Heating rate V_c between 20 and 700° C. was 10° C./s. The blanks were finally hot stamped and quenched in order to obtain full martensitic structures. The parts obtained after hot-stamping are covered by a coating, 40 micrometers thick, illustrated at FIG. 1, which has a four layer structure. Starting from the steel substrate, the layers are the following:

[00130] (a) Interdiffusion layer or intermetallic layer, 17 micrometers thick. This layer is itself composed of two sub-layers. Hardness HV50g ranges from 295 to 407, and the mean composition is: 90% Fe, 7% Al, 3% Si.

[00131] (b) Intermediate layer, appearing darker, 8 micrometers thick. This layer has a hardness of 940HV50g and a mean composition, by weight: 43% Fe, 57% Al, 1% Si.

[00132] (c) Intermetallic layer appearing as a pale phase, 8 micrometers thick, displaying a hardness of 610HV50g, a mean composition of 65% Fe, 31% Al, 4% Si

[00133] (d) Darker superficial layer, 7 micrometers thick, 950 HV50g, with a mean composition of 45% Fe, 54% Al, 1% Si. Layers (c) and (d) are quasi-continuous, i.e. occupying at least 90% of the level corresponding to the considered layer. In particular, layer (c) does not reach the extreme surface except very exceptionally. Anyway, this layer (c) occupies less than 10% of the extreme surface. ii) Conditions of reference: On the other hand, blanks with the same base material and pre-coating parts were furnace-heated in different conditions: The blanks were heated to 950° C. for 7 minutes, this time including the heating phase. Heating rate Vc was 11° C./s. These conditions correspond to a degree of alloying which is more important than in conditions (i).

[00134] In this coating, the pale intermetallic layer (c), is not continuous and appears as to be scattered within the coating. About 50% of this layer is present at the extreme surface of the part. Moreover, the interdiffusion layer, 10 micrometers thick in contact with the steel substrate is thinner than in the previous case of FIG. 1.

[00135] Resistance spot welding was performed in the two situations i) and ii):

[00136] (i): Coating with quasi-continuous layers (c) and (d), layer (c) occupying less than 10% of the extreme surface

[00137] (ii): Coating with mixed and discontinuous layers, layer (c) occupying more than 10% of the extreme surface. Resistance spot welding was performed by superposing two parts and joining them in the following conditions:

[00138] Squeeze force and welding force: 4000 N

[00139] Squeeze time: 50 periods

[00140] Welding and holding time: 18 periods respectively. In each condition, the suitable intensity range was determined for obtaining:

[00141] No sputter during welding

[00142] Acceptable nugget size. For the condition i), the weldability range, expressed in terms of current intensity, is 1.4 kA. For the condition ii) the weldability range is extremely small.

[00143] Thus, it may be seen that the coating according to the invention, yields much more satisfactory results.

Example 3

[00144] In a third example of implementation, a cold rolled steel sheet of the example 1 was cut into blanks of 500.times.500 mm.sup.2 which were heated at 920° C., during 6 mn, then hot stamped and cooled in tools, in such conditions that two different cooling rates were obtained:

[00145] (A): Cooling rate: VA=30° C./s

[00146] (B): Cooling rate: VB=60° C./s Due to the shape of the parts, different deformation levels .epsilon. were created during hot stamping. In particular, some zones largely strained display deformation levels higher than 30%.

[00147] As illustrated on FIG. 3, metallographic observations reveal that when .epsilon.>10%, partial bainitic or ferritic transformation occurs on parts cooled with VA=30° C./s, mainly on former austenitic grain boundaries. On the other hand, the parts cooled with VB=60° C./s display fully martensitic microstructure as illustrated on FIG. 4. The latter structures display superior mechanic resistance and a great homogeneity in the case of mechanical solicitation. Thus, even

in products or parts where straining is larger than 10%, the application of cooling according to the invention guarantees a microstructural and mechanical homogeneity.

Example 4

[00148] In a fourth example of implementation, steel castings containing different values of sulfur, were elaborated. These steels were further hot rolled, then cold rolled steel into sheets, 2.2 mm thick. Sulfur content varies from 11 ppm (0.0011%) to 59 ppm (0.006%) in weight. Apart sulfur, the compositions of these different steel castings comprise in weight: 0.24% carbon, 1.17% manganese, 0.01% phosphorus, 0.25% silicon, 0.045% aluminum, 0.01% copper, 0.02% nickel, 0.2% chromium, 0.04% titanium, 0.003% boron, 0.002% calcium, the remainder being iron and unavoidable impurities. These sheets were pre-coated with an aluminum-based alloy of composition comprising 9.3% silicon, 2.8% iron, the remainder being aluminum and unavoidable impurities. The sheets were afterwards cut into blanks which were heated at 950° C. for 5 mn, then hot stamped and cooled in tools in order to obtain a full martensitic structure. Mechanical resistance exceeded 1450 MPa. Specimens were extracted according to the transverse sense of rolling direction and submitted to a bending test with alternate bending modes. The inventors put into evidence that the critical bending angle (angle at fracture) is closely related to the sulfur content of the steel: when sulfur content is lower than 0.002%, the bending angle exceeds 60°, which indicates higher ductility and energy absorption. Compact Tensile-Test type specimens were also extracted according to the transverse rolling direction in order to measure the resistance to tearing, i.e. the energy which is necessary for the initiation or propagation of an existing crack. The results, illustrated on FIG. 6, indicate that a initiation energy higher than 18 Joules is achieved when sulfur content is lower than 0.002% in weight. As these qualities of high resistance, high energy absorption and weldability are required in automobile industry, the parts or products fabricated according to the invention will be used with profit for such applications.

[00149] While the above description is clear with regard to the understanding of the invention, the following terms as used in the following list of preferred embodiments and claims have the following noted meanings in order to avoid any confusion:

[00150] pre-coating—the material (Al or Al alloy) coated on or located on at least a portion of the strip or sheet, etc., of base steel to form a pre-coating/base composite, the composite not having been subjected to an alliation reaction between the coated Al or Al alloy material and base steel

[00151] alliation—a reaction between the pre-coating and base steel, to produce at least one intermediate layer different in composition from both the base steel and the pre-coating. The alliation reaction happens during the heat treatment immediately preceding hot stamping. The alliation reaction affects the total thickness of the pre-coating. In a highly preferred embodiment the alliation reaction forms the following layers: (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial as described above;

[00152] pre-coated steel—the pre-coating/base composite, not having been subjected to an alliation reaction between the coated material and base steel;

[00153] coating—the pre-coating after having been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coating comprises layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[00154] coated steel or product—the pre-coated steel or product that has been subjected to an alliation reaction between the pre-coating and base steel. In a highly preferred embodiment the coated steel is a strip or sheet, etc., of base steel having thereon an invention coating comprising layers (a) interdiffusion, (b) intermediate, (c) intermetallic, and (d) superficial described above;

[00155] blank—a shape cut from a strip.

[00156] product—a stamped blank

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/319,306	Filing Date 05/13/2021	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/15/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
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Application Number	17319306
Filing Date	2021-05-13
First Named Inventor	Drillet
Art Unit	
Examiner Name	
Attorney Docket Number	20631.1028CON7

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	1	7867344	B2	2011-01-11	Kusumi et al.	
	2					

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	1	20040238080	A1	2004-12-02	Vandeputte et al.	

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	1	2004106573	WO	A1	2004-12-09	SUMITOMO METAL IND	See English translation	
	2	2833504	FR	A1	2003-06-20	Laurent et al.	See English translation	

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	3	1013785	FR	B1	2006-10-25	Laurent	See English translation	
	4	2006051543	JP	A	2006-02-23	Kusumi et al.	See English machine translation, also e.g. US 7867344	

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	1	Mahesh C. Somani, et al., "Dimensional Changes and Microstructural Evolution in a B-bearing Steel in the Simulated Forming and Quenching Process," ISIJ International, 2001, Volume 41, Issue 4, Pages 361-367 ("Somani")	
	2	Declaration of Mel Desart, dated April 16, 2019, relating to attached "High Strength Steels for Automotive Safety Parts," SAE Technical Paper 2001-01-0078. 2001, by Cornette, D., Hourman, T., Hudin, O., Laurent, J., and Reynaert, A."	
	3	Declaration Dr. Michael Miles, dated June 28, 2019 as filed in IPR2019-01275, US Patent No. 9,708,683	
	4	Declaration of Mel Desart, dated May 30, 2019, relating to attached "High Strength Steels for Automotive Safety Parts," SAE 2001 Transactions Journal of Materials & Manufacturing-V110-5, by Corneae, D., Hourman, T., Hudin, O., Laurent, J., and Reynaert, A."	
	5	Declaration of Dr. Michael L. Knott dated April 22, 2019 realting to attached Somani (Mahesh C. Somani, et al., "Dimensional Changes and Microstructural Evolution in a B-bearing Steel in the Simulated Forming and Quenching Process," ISIJ International, 2001, Volume 41, Issue 4, Pages 361-367 ("Somani")) from University of Michigan's Art, Architecture, and Engineering Library's Technical Services Department	
	6	Publication History from SAE Mobilus, dated May 30, 2019 for Cornette et al., "High Strength Steels for Automotive Safety Parts" SAE Technical Paper Series 2001-01-0078, March 24 001, ISSN: 0148-7191	
	7	Fekete, J., Stibich, A., and Shi, M., "A Comparison of the Response of HSLA and Dual Phase Sheet Steel in Dynamic Crush," SAE Technical Paper 2001-01-3101, 2001	

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	8	Robert R. Mayer, "Theoretical Effects of Hydroforming on Crashworthiness of Straight Sections," ASME International Mechanical Engineering Congress and Exposition, Applied Mechanics (2004):591-603	
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	10	Webster's New Twentieth Century Dictionary (2nd ed. 1964), published by The World Publishing Company	
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	12	ASM Materials Engineering Dictionary, ASM INternational, The Materials Information Society, 1992	
	13	Dictionary of Materials and Manufacturing, Nichols Publishing: New York, 1990	
	14	McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, 2003	
	15	Certified Translation of "alliation" and "alliage"	
	16	Ahindra Ghosh, "Secondary Steelmaking, Principles and Applications" (2001), CRC Press	
	17	Åkerström, P. et al., "Material parameter estimation for boron steel from simultaneous cooling and compression experiments," Modelling and Simulation in Materials Science and Engineering. 2005, Vol.13, No.8, p.1291	
	18	ASTM Dictionaly of Engineering Science & Technology, ASTM International 2005	

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	19	Chambers Dictionary of Science and Technology, Tenth edition, 1999	
	20	Webster's Third New International Dictionary of the English Language Unabridged, 2003	
	21	Engels, H. et al., "Controlling and Monitoring of the Hot-Stamping Process of Boron-Alloyed Heat-Treated Steels." – p. 135-50 ("Engels"), published in Liewald, M. (Ed.). "New developments in sheet metal forming": Frankfurt a.M.: MATINFO, Werkstoff-Informationsges (2006)	
	22	Declaration of Marcel Thoms of University of Stuttgart dated June 7, 2019 relating to attached "Engels, H. et al., "Controlling and Monitoring of the Hot-Stamping Process of Boron-Alloyed Heat-Treated Steels." – p. 135-50 ("Engels"), published in Liewald, M. (Ed.). "New developments in sheet metal forming": Frankfurt a.M.: MATINFO, Werkstoff-Informationsges (2006)"	
	23	Certified translation of "Stahl"	
	24	Preliminary Opinion issued on June 19, 2019 in opposition proceedings of European Patent Application 06842403.5	

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	Examiner Name	
	Attorney Docket Number	20631.1028CON7

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Name/Print	William C. Gehris	Registration Number	38156

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First Named Inventor	Drillet
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Attorney Docket Number	20631.1028CON7

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	1	6296805	B1	2001-10-02	Laurent et al.	
	2	7559998	B2	2009-07-14	Nishibata et al.	
	3	8307680		2012-11-13	Drillet et al.	
	4	9708683		2017-07-18	Drillet et al.	
	5	8127449	B2	2012-03-06	Bayer et al.	
	6	7137201		2006-11-21	Brodt et al.	
	7	7708843		2010-05-04	Laurent et al.	
	8	3240269		1966-03-15	Thomas	

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	9	7503116		2009-03-17	Machrowicz et al.	
	10	7217331		2007-03-15	Jambu et al.	
	11	5296805		2001-10-02	Laurent et al.	
	12	5815087		2004-11-09	Takagi et al.	
	13	5023113		1991-06-11	Boston et al.	
	14	7137201		2006-11-21	Brodt et al.	

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	2	20070163683	A1	2007-07-19	Schiessl	
	3	20010042393	A1	2001-11-22	Kefferstein et al.	

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	4	20110056594	A1	2011-03-10	Machercy et al.	
	5	20070175040		2007-08-02	Bayer et al.	
	6	20040009366		2004-01-15	Takagi et al.	
	7	20030152796		2003-08-14	Clancy et al.	
	8	20110006491		2011-01-13	Drillet et al.	

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	1	3290199	EP	A1	2018-03-07	Drillet	In English	
	2	2758571	FR	A	1998-07-24	Lorraine	See English Abstract and EPO machine translation	
	3	2006097593	WO	A	2006-09-21	Laurent	See US 2008/0283156	
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	5	2242863	EP	B1	2014-01-08	ArcelorMittal France	In English	
	6	2005078144	WO	A1	2005-08-25	Audi AG	See US 2007/163683	
	7	2833504	FR	A1	2003-06-20	Usinor	See English Abstract and EPO machine translation	
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	9	2012048841	WO	A1	2012-04-19	Tata Steel IJMUIDEN B. V.	In English	
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	16	02103073	WO	A2	2002-12-27	Nippon Steel Corporation	In English	
	17	3931251	JP		2007-06-13	Laurent	See US 6296805	
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	27	1472068	CN	A	2004-02-04		See US6815087	
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	1	Raviere et al, Hot Stamping Experiment and Numerical Simulation of Pre-coated USIBOR1500 Quenchable Steels, SAE 2003-01-2859, 2003	
	2	Merklein, M et al., "Einflussgrößen im Presshärteprozess" Tagungsband 4. Chemnitzer Karosseriekolloquium, November 2005, ISSN: 3-937524-33-9, see English translation	
	3	Forschungsvereinigung Stahlanwendungen e. V., "Forschung für die Praxis P644 - Auslegung des Prozessfensters für die Blechumformung höchstfester Vergütungsstähle bei erhöhten Temperaturen" Düsseldorf: Verlags und Vertriebsgesellschaft mbH, 2006, ISBN: 3-937567-42-9, see partial English translation	
	4	Usinor Auto Groupe website, Product Description, USIBOR Heattreatable manganese-boron steel, bare or precoated 1/3, http://www.usinorauto.com/v_anglaise/produits/fiches/ a_usibor3.htm, Feb. 21, 2003	
	5	Usinor Auto Groupe website, Product Description, USIBOR Heattreatable manganese-boron steel, bare or precoated 2/3, http://www.usinorauto.com/v_anglaise/produits/fiches/ a_usibor3.htm, Apr. 29, 2002	

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	6	Usinor Auto Groupe website, Product Description, USIBOR Heattreatable manganese-boron steel, bare or precoated 3/3, http://www.usinorauto.com/v_anglaise/produits/fiches/ a_usibor3.htm, Apr. 29, 2002	
	7	Altan, 'Hot-stamping boron-alloyed steels for automotive parts - Part II: Microstructure, material strength changes during hot stamping', Stamping Journal, January 2007	
	8	Merklein M.: "Neuere Entwicklungen zur Umformung höchstfester Stahlwerkstoffe," EFB-Kolloquium 2005, see English translation	
	9	Roll et al.: "Prozesskette zum Warmumformen von Blechen," Tagungsband SFU Leichtbau durch Umformtechnik, September 2005, see English translation	
	10	Laurent J.-P. "Hot formed Pre-coated boron steels: A solution of the resistance-formability's dilemma" - 1st European Conference of Experts, 10/14/2003	
	11	Garcia Aranda L., Ravier P., Chastel Y., "Hot stamping of quenchable steels - Material data and process simulations", IDDRG conference, 2003	
	12	Merklein M., "Characterisation of the Flow Properties of the Quenchenable Ultra High Strength Steel 22MnB5", Annals of the CIRP Vol. 55/1/2006	
	13	Turetta A., Testing material formability in hot stamping operations, 2006	
	14	Babbit M., "Some Highlights on New Steel Products for Automotive Use," steel research international Col. 77, issue 9 to 10, Dec. 13, 2016	
	15	Laurent J.-P., "Hot formed Pre-coated boron steels, A solution of the resistance-formability's dilemma" - 1st European Conference of experts, Hot Forming and Casting Tachnologies for Lightweight Automobile Design, 27./28. November 2003	
	16	Garcia Aranda L., Chastel Y., "Experiments and simulation of hot stamping of quenchable steels," ICTP 7th International Conference on Technology of Plasticity, Advanced Technology of Plasticity 2002, Proceedings, Vol. 2, Yokohama, JP, Oct. 27-Nov. 1, 2002	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17319306
	Filing Date	2021-05-13
	First Named Inventor	Drillet
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	17	Suehiro, Masayoshi et al., "Properties of Aluminium-coated Steels for Hot-forming" NIPPON STEEL TECHNICAL REPORT No. 88, Juli 2003	
	18	Kefferstein R., "Development of safety and structural automotive parts by hot-stamping, the USIBOR 1500P solution", La Revue de Metallurgie, ATS - JSI 2004	
	19	Geilfuss A., Kraska M., "Untersuchungen zum Warmumform-prozess ultrahochdester Stähle" - 1st European Conference of experts, Hot Forming and Casting Technologies for Lightweight Automobile Design, 27./28. November 2003, see English Translation	
	20	Gehringhoff, "Neueste Trends und Entwicklungen in der Warmumformung" aus Tagungsband" Aluminium and steel forming in automotive engineering 17/18 February 2005" Berlin: tci - Technik & Kommunikation-Verl.-GmbH, 2005, In English	
	21	Grothe, "Dubbel - Taschenbuch für den Maschinenbau" Berlin Heidelberg: Springer, 2005, Ed. 21. Auflage, ISBN: 3-540-22142-5 see English translation	
	22	Paland, "Technisches Taschenbuch, 7. veränderter Nachdruck" Herzogenaurach: Schaeffler KG, 2002, see English translation	
	23	Hein, Kefferstein and Dahan, 'Hot Stamping of USIBOR 1500 P: Part and Process Analysis Based on Numerical Simulation', in: Liewald (eds), New Developments in Sheet Metal Forming, 2006, in English and English partial translations	
	24	Cornette et al., "High Strength Steels for Automotive Safety Parts" SAE Technical Paper Series 2001-01-0078, March 2001, ISSN: 0148-7191	
	25	Technische Lieferspezifikation TL VW 4225-2006:5 "Legierter Vergütungsstahl 22Mn85 unbeschichtet oder vorbeschichtet", May 2006, see English Translation	
	26	Vaissiere et al., "Development of pre-coated boron steel for applications on PSA Peugeot Citroen and Renault bodies in white "IBEC 2003" und SAE Technical Paper Series 2002-01-2048, Juli 2002 - ISSN: 0148-7191	
	27	TNOReport 010028844 - Analyses on hot-formed coated steel samples, August 20, 2015/Proces-verbaa/ Agin Boeder on sample taking of the Volkswagen Passat, see partial English translation	

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	28	"Standard Specification for Steel Sheet, Aluminum Cotaed," by Hot-Dip Process. ASTM Standard A 463/A 463M - 06, 2006	
	29	Preliminary Opinion of the European Patent Office Board of Appeal on EP 2 242 863 B1, dated July 3, 2018	
	30	Decision of the District Court The Hague on EP224286381, September 13, 2017 including English Translation	
	31	Winkel: "Quetten zum Presshärten von Stahlblech im Automobilbau/ Quenches for press hardening steel plate in the car industry," Fachberichte, Gaswaerme International (53) Nr. 7/2004, see English translation	
	32	Engels H., Schalmin, 0., Müller-Bollenhagen, C., "Regelung und Überwachung des Warmumformprozesses vorlegierter Vergütungsstähle in Vortragstexte zur Veranstaltung Internationale Konferenz "Neuere Entwicklungen in der Blechumformung" ..." Neuere Entwicklungen in der Blechumformung in Leinfelden-Echterdingen am 9.+10. Mai 2006 unter Leitung von Prof. Dr.-Ing Liewald, 2006, English version provided	
	33	Extended European Search Report EP3290199, dated February 7, 2018	
	34	Extended European Search Report EP3290200, dated March 12, 2018	
	35	Declaration of Sascha Sikora, August 29, 2018 see partial English translation	
	36	Remarks re EP2086755 features (Re-adjustment of EP2086755 Application Example 2), see English translation	
	37	Expert opinion re "Citroen C5 VF7RC4HXE76658312, registration date 2005", March 2, 2018, see English translation	
	38	Expert opinion re "Citroen C5 VF7DE4HXB76075211, Registration date 2001", August 15, 2018, see English translation	

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	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	39	Niederschrift über Tatsachenaufnahme und Beobachtung des Notars anlässlich des Ausbaus eines Bauteils aus einem Fahrzeug, October 22, 2018, see English translation ("Record of facts and observation of the notary on the occasion of the removal of a component from a vehicle and the metallographic preparation")	
	40	DVS Presentation by Carsten Lachmann, Jan 18, 2008	
	41	Application report: Examination of body components with AlSi coating systems, Application No.: 18041806a-A2004 by TAZ GmbH, August 27, 2018, See English translation	
	42	Application report: Examination of body components with AlSi coating systems, Application No.: 18041806a-S2001 by TAZ GmbH, August 27, 2018, see English translation	
	43	Kraftfahrtbundesamt, "Neuzulassungen von Personenkratwagen", 9 Feb. 2005	
	44	autoscout24.de, "Suchergebnisse "Citroen C5, Erstzulassung 2005"	
	45	autoscout24.de, "Suchergebnisse "Citroen C5, Erstzulassung 2001"	
	46	mobile.de, "Suchergebnisse "Citroen C5, Erstzulassung 2005"	
	47	mobile.de, "Suchergebnisse "Citroen C5, Erstzulassung 2001"	
	48	Record of facts and observation of the notary on the occasion of the removal of a component from a vehicle and the metallographic preparation by Notary Eik Löffelbein, August 22, 2018	
	49	Evaluation of the porosity of the coating in a reference range of a Fig. (Fig. 22 of Cornette et al., "High Strength Steels for Automotive Safety Parts" SAE Technical Paper Series 2001-01-0078, March 2001, ISSN: 0148-7191) - "Bildanalyse eines Literaturbildes, Applications-Nr. 18041806a-Literaturbild", August 27, 2018, see partial translation	

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	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	50	Boezewinkel et al.: Tata Steel analysis of Volkwagen Passat. Project 11450, Oct. 7, 2017	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/Daniel J. Schleis/	Date Considered	09/28/2021

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	57392

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

23280 7590 10/01/2021

Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

EXAMINER	
SCHLEIS, DANIEL J	

ART UNIT	PAPER NUMBER
1784	

NOTIFICATION DATE	DELIVERY MODE
10/01/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ddk@ddkpatent.com

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 17/319,306	Applicant(s) DRILLET et al.	
	Examiner Daniel J Schleis	Art Unit 1784	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 09/15/2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 25-49 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 25-49 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 05/13/2021 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 05/18/21, 05/18/21, 05/18/21, 05/18/21

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Election/Restrictions

Applicant's election of Group I, claims 25-49, in the reply filed on 15 September 2021 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.01(a)).

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 18 May 2021 were considered by the examiner.

Claim Rejections - 35 USC § 102

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

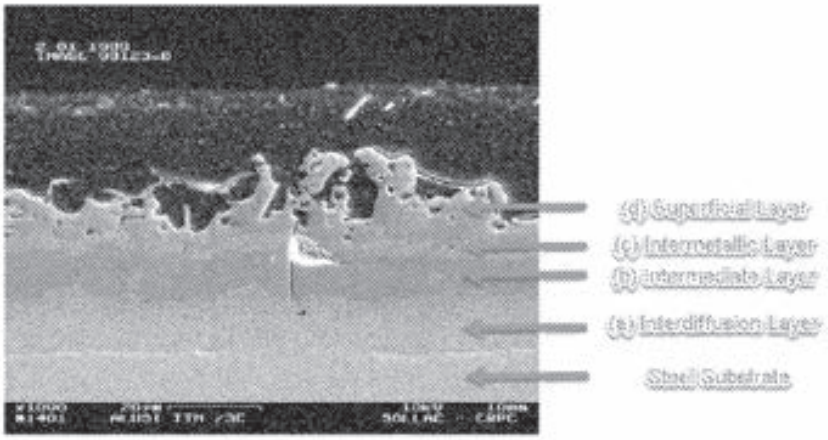
The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 25, 26, 28-38, and 48-49 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Cornette, C., et al, *High Strength Steels for Automotive Safety Parts*, Society of Auto. Engineers, Inc. (2001) (Cornette).

In regards to independent claim 25, Cornette addresses the mechanical testing and different design solutions associated with various steel grades. (Abstract) A specific part deals with ultra-high tensile strength pre-coated boron steel for hot forming. (Abstract) Therefore, Cornette teaches a hot stamped steel product.

A steel sheet with a thickness of 1.5 mm was provided with an Al-Si coating. (Mechanical Characteristics, Page 8) The coating is made of aluminum and silicon and is applied with a hot-dipped process. (Description of the coating, Page 7) The average layer thickness showing the best compromise between corrosion protection and weldability is 25 microns. (Description of the Coating, Page 7) Heating the pre-coating steel at 900 C for 5 minutes creates an alloying reaction between the substrate and the coating which leads to a hard multiphase alloy layer. (Description of the Coating, Page 7) The resulting Fe-Al-Si layer is typically about 40 microns. (Description of the Coating, Page 7) Below is a section view of the resulting coating after heat treatment reproduced from Cornette, (Figure 22, Page 8)



This figure shows that the product of Cornette has four layers corresponding to the claimed layers. The different colorations of the respective layers indicate that the respective layers have different compositions. Therefore, the different layers would each have different mean compositions from one another.

As to claim 26, Figure 22 shows that the thickness of layer (a) is less than half the thickness of the coating.

As to claim 28, Figure 22 shows that a thickness of layer (a) is less than 17 micrometers.

As to Figure 29, Figure 22 shows that a thickness of layer (a) is less than 15 micrometers.

As to claim 30, the resulting Fe-Al-Si layer is typically about 40 microns. (Description of the Coating, Page 7)

As to claim 31, the process of producing the product of Cornette appears to be identical or substantially identical to that utilized to produce the claimed product. In particular, Cornette teaches applying an Al-Si coating onto a steel and heating for 900 C for 5 minutes to form a 1.5 mm thick product. (See Description of Coating, Page 7 and Mechanical Characteristics, Page 8) The heating at 900 C for 5 minutes creates an alloying reaction between the substrate and coating which leads to a hard multiphase alloy layer. (Description of the coating, Page 7)

The instant application teaches that for sheets that are 0.7 mm to 1.5 mm, the preferred treatment conditions are shown in Figure 7 of the instant application within the limits of diagram ABCD. (Specification, ¶59) This heat treatment creates the respective layers.

The process of Cornette falls within the diagram of ABCD.

Further, since the respective layers are formed by interdiffusion, both within the instant application and Cornette, it would be expected that the iron content would decrease as one moves

away from the source of the iron. The iron is found within the substrate and not included within the Al-Si coating. Therefore, the iron content would be expected to decrease within the respective layers as they are further from the substrate.

As to claims 32-38, Figure 22 shows that layer (a) has a thickness greater than a thickness of layer (b); that layer (a) has a thickness that is greater than a thickness of layer (c); and that layer (a) has a thickness that is greater than a thickness of layer (d). Likewise, Figure 22 shows that a thickness of layer (a) is more than twice a thickness of layers (b), (c), and (d), respectively.

As to claims 48 and 49, Cornette teaches that the UTS is 1510 MPa. (Mechanical Characteristics, Page 8)

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of pre-AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

Claims 40 and 41 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Cornette.

As to claims 40 and 41, Cornette teaches utilizing USIBOR 1500. (Composition of the Base Material, Page 7) The compositional ranges for the respective elements are set forth within Table III. P is not a required element and would therefore be expected to be present as an impurity within the claimed ranges.

Table III. Chemical composition of pre-coated boron steel in thousandths of percent

	C	Mn	Si	S	Cr	Al	B	Ti
Min.	200	1100	150		150	20	2	20
Max.	250	1350	350	8	300	60	4	50

The compositional ranges overlap the claimed ranges. Therefore, a prima facie case of obviousness has been established.

Claims 27 and 42-47 rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Cornette as applied to claim 25 above, and further in view of U.S. Patent Number 6,296,805 (Laurent).

As to claims 27 and 42-47, As shown above, Cornette teaches a stamped sheet having the claimed coating layers. While Cornette generally teaches applying an Al-Si coating by hot dipping, it does not explicitly set forth the composition of the coating, which would then impact the compositions of the resulting layers within the coating.

In the same field of endeavor of coated steel sheets provided with an aluminum alloy coating, Laurent is directed to coated rolled steel sheet comprising a very high resistance after thermal treatment. (1:6-8) The steel composition overlaps the composition set forth within Cornette. (1:47-64) The sheet is provided with a coating that has been formed by dipping in an aluminum bath containing 8 to 11% silicon, from 2 to 4% iron. (2:40-45) The coating protects the basic sheet against hot and cold corrosion. (2:46-47) The coating forms a layer having substantial resistance to corrosion and a good capacity for painting and gluing. (2:57-61)

It would have been obvious to one of ordinary skill in the art to have utilized the coating of Laurent as the hot-dip coating of Cornette. One of ordinary skill in the art would have been motivated by the desire and expectation of combining prior art elements according to known method to yield predictable results, including selecting a hot-dip coating that is known for use on an overlapping composition base steel that provides the necessary corrosion protection to the base steel and has a good capacity for painting and gluing.

The product of Cornette in view of Laurent would be expected to have the claimed composition ranges within the respective layers. The process of producing the product of Cornette appears to be identical or substantially identical to that utilized to produce the claimed product. In particular, Cornette teaches applying an Al-Si coating onto a steel and heating for 900 C for 5 minutes to form a 1.5 mm thick product. (See Description of Coating, Page 7 and Mechanical Characteristics, Page 8) The heating at 900 C for 5 minutes creates an alloying

reaction between the substrate and coating which leads to a hard multiphase alloy layer. (Description of the coating, Page 7) Laurent teaches that the sheet is provided with a coating that has been formed by dipping in an aluminum bath containing 8 to 11% silicon, from 2 to 4% iron. (2:40-45)

The instant application teaches that for sheets that are 0.7 mm to 1.5 mm, the preferred treatment conditions are shown in Figure 7 of the instant application within the limits of diagram ABCD. (Specification, ¶59) This heat treatment creates the respective layers. The instant application teaches forming a pre-coating by dipping in an aluminum bath with 8 to 11% silicon and 2 to 4% iron. (Specification, ¶102) After the thermal treatment, the product has the respective strength and hardness values. (See Specification ¶101 and ¶107)

Therefore, Cornette in view of Laurent teaches applying the same coating by means of dipping in an aluminum bath and then providing a heat treatment that falls within the diagram of ABCD.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J Schleis whose telephone number is (571)270-5636. The examiner can normally be reached on 10 AM to 4 PM Monday through Friday.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Humera Sheikh can be reached on (571) 272-0604. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel J. Schleis
Primary Examiner
Art Unit 1784

/Daniel J. Schleis/
Primary Examiner, Art Unit 1784

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	09/28/2021	Schleis
Assignee Name Search	09/28/2021	Schleis
Reviewed Global Dossier	09/28/2021	Schleis
Reviewed File Wrapper of Related Family Applications	09/28/2021	Schleis
Reviewed IPR2019-01275 Proceedings	09/28/2021	Schleis
STN Search	09/28/2021	Schleis
IP.COM Search	09/28/2021	Schleis
EAST Text Search	09/28/2021	Schleis

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	13	((PASCAL) near2 (DRILLET)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S2	8	((DOMINIQUE) near2 (SPEHNER)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S3	11	((RONALD) near2 (KEFFERSTEIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S4	0	("2013/0029172").URPN.	USPAT	OR	ON	2013/02/26 09:51
S5	9	("20030152796" | "3240269" | "5023113" | "6296805" | "6815087" | "7137201" | "7217331" | "7503116").PN. OR ("8307680").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S6	4	("20030152796" | "5023113" | "6296805" | "7137201").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:05
S7	9	("4891274" | "5133815" | "5178688" | "5656102").PN. OR ("6296805").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:37
S8	4	("3214820" | "6197132" | "6296805").PN. OR ("7708843").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:40
S9	16	("20010042393" | "20070082214" | "20070163685" | "20090242086" | "20090308499" | "20110006491" | "20110165436" | "4546051" | "6017643" | "6093498" | "6296805" | "6298905" | "6564604" | "6815087" | "7137201" | "7867344").PN. OR ("8066829").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:40
S10	1	("2003/0152796").URPN.	USPAT	OR	ON	2013/02/26 10:43
S11	17	("1423747" | "3240269" | "4657717" | "4921159" | "5056209" | "6337471").PN. OR ("7137201").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:45
S12	10	("3632453" | "3664293" | "4751957" | "4891274" | "5518772" | "5529816").PN. OR ("6017643").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:47

S13	195	(("5209860") or ("8066829") or ("8066829") or ("8307680") or ("20110006491") or ("20110165436") or ("20110214475") or ("20120064362") or ("20130029172") or ("6564604") or ("20010042393") or ("20120118437") or ("4846986") or ("20120085467") or ("20080261058") or ("4601766") or ("5248528") or ("5456953") or ("5568914") or ("5830290") or ("20040118482") or ("5287983") or ("4880481") or ("4344342") or ("4963400") or ("4999241") or ("5342672") or ("5792180") or ("6070444") or ("4353765") or ("5982073") or ("6129790") or ("6165595") or ("3798406") or ("4033918") or ("4311755") or ("4488862") or ("4508755") or ("4514264") or ("4525177") or ("4551085") or ("4554765") or ("4585519") or ("4842887") or ("4994517") or ("5273369") or ("5389452") or ("5538576") or ("5542978") or ("5639510") or ("5697715") or ("5729616") or ("5801128") or ("5837314") or ("5869160") or ("6020026") or ("6019923") or ("6251514") or ("6258425") or ("6262513") or ("6309748") or ("6340397") or ("6342108") or ("20020014181") or ("20090025836") or ("20090048127") or ("4374168") or ("4309951") or ("5810332") or ("5795661") or ("8349098") or ("20020160235") or ("20020166606") or ("20100294400") or ("20110056594") or ("20110056594") or ("20120085466") or ("5981089") or ("6197125") or ("4793867") or ("4941930") or ("4980241") or ("5238506") or ("5405427") or ("5939144") or ("6090873") or ("6241393") or ("3859239") or ("3850684") or ("3850647") or ("4316751") or ("4347085") or ("4401719") or ("4402994") or ("4533606") or ("4592958") or ("4867853") or ("5232619") or ("5242506") or ("5290362") or ("5332776") or ("5466280") or ("5608028") or ("5643474") or ("5700551") or ("5743536") or	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 10:54

		("5783622") or ("5786098") or ("5851659") or ("5863640") or ("5890852") or ("5955201") or ("6001494") or ("6042949") or ("6083613") or ("6194088") or ("6197436") or ("6284059") or ("6329456") or ("6410626") or ("7533713") or ("8025965") or ("8025965") or ("20030150308") or ("20040129346") or ("20040216860") or ("20070209555") or ("20080090093") or ("20100175794") or ("20110300407") or ("20100199872") or ("4793218") or ("5584845") or ("5759304") or ("6463779") or ("7703820") or ("7926180") or ("7926180") or ("20070045384") or ("20070051434") or ("20090058111") or ("20100187291")).PN. or (("20110247467") or ("4384011") or ("5960930") or ("6120604") or ("4863650") or ("4926792") or ("4942061") or ("4035528") or ("4342418") or ("4355059") or ("4490129") or ("4611610") or ("4818570") or ("4925213") or ("5300362") or ("5728474") or ("5809628") or ("5820954") or ("6037053") or ("6132864") or ("6403192") or ("8042484") or ("20080000417") or ("20080305358") or ("20090220815") or ("20120074106") or ("20120152410") or ("4486172") or ("4537588") or ("4844327") or ("4925518") or ("7955413") or ("4283225") or ("4302515") or ("4314661") or ("4316572") or ("4358325") or ("4480016") or ("4801072") or ("4853047") or ("5018259") or ("5271318") or ("5533423") or ("5622674") or ("5660443") or ("5926516") or ("6554919") or ("6986536") or ("RE40736") or ("7955413") or ("20010049956") or ("20050285416") or ("20050285417") or ("20080257110") or ("20090173129") or ("20110266724") or ("20120120561") or ("4251549")).PN.				
S14	0	("2012/0085466").URPN.	USPAT	OR	ON	2013/02/26 10:55
S15	0	("2012/0085467").URPN.	USPAT	OR	ON	2013/02/26 10:55

S16	0	("2011/0214475").URPN.	USPAT	OR	ON	2013/02/26 10:55
S17	1	("2011/0165436").URPN.	USPAT	OR	ON	2013/02/26 10:56
S18	1	("2011/0006491").URPN.	USPAT	OR	ON	2013/02/26 10:56
S19	8,085	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 11:01
S20	2,517	S19 and (steel ferrous) same (aluminum aluminium al)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 11:02
S21	304	S20 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 11:03
S22	14	("20020068189" | "20020104876" | "20030012977" | "20030207769" | "20040028939" | "3195991" | "4957822" | "4973523" | "5112416" | "5362574" | "5384205" | "5470666" | "7074496").PN. OR ("8053087").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 12:13
S23	8,085	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 12:33
S24	286	S23 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 12:33
S25	59	S24 and (aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 12:35
S26	0	("2010/0294400").URPN.	USPAT	OR	ON	2013/02/26 12:36
S27	2	("2001/0001049").URPN.	USPAT	OR	ON	2013/02/26 12:40
S28	8,224	((428/601,600,602,653) or (420/104,120,121,126) or	US-PGPUB; USPAT; USOCR	OR	OFF	2013/09/19 16:58

		(148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.				
S29	456	S28 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:58
S30	4	S29 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:59
S31	36	S28 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:59
S32	16	("20060134451" | "20070113936" | "20070166565" | "20070246509" | "20090020276" | "20090165901" | "20100101688" | "20100112370" | "20100183897" | "20110014494" | "20110240280" | "20110287276" | "20110287277" | "5037707" | "6019939" | "7387844").PN. OR ("8247082").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 16:59
S33	0	("2010/0084057").URPN.	USPAT	OR	ON	2013/09/19 16:59
S34	13	("4673551" | "4906534" | "5037707" | "5100048").PN. OR ("6019939").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:00
S35	4	("2010/0112370").URPN.	USPAT	OR	ON	2013/09/19 17:00
S36	0	("2009/0252641").URPN.	USPAT	OR	ON	2013/09/19 17:00
S37	4	("4985196" | "4990545" | "5139832" | "6084849").PN. OR ("7060140").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:00
S38	15	("4196025" | "4309886" | "4793869" | "5507677" | "5509842" | "5618401" | "5625251" | "5629051" | "5646478").PN. OR ("5871851").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01
S39	9	("4601766" | "5019191" | "5871851").PN. OR ("6129992").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01
S40	4	("3795971" | "4455352" | "4956025").PN. OR ("5529644").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01

S45	40	(("20010042393") or ("8127449") or ("7137201") or ("7708843") or ("20070163683") or ("20070175040") or ("3240269") or ("7503116") or ("7217331")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2017/03/10 08:29
S46	10	(("20010042393") or ("8127449") or ("7137201") or ("7708843") or ("20070163683") or ("20070175040") or ("3240269") or ("7503116") or ("7217331")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/03/10 08:43
S47	4	("3214820" | "6197132" | "6296805").PN. OR ("7708843").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/10 08:48
S48	8,872	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/07/08 10:56
S49	540	S48 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 10:56
S50	13,610	(C21D9/46 or C23C2/12 or C23C2/40 or C23C2/26 or B32B15/012 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 10:58
S51	977	S50 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 11:00
S52	2	S51 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 11:02
S53	15,239	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:44
S54	1,407	S53 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:45

S55	1,300	(B32B15/012).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:46
S56	167	S55 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:46
S57	15,511	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:40
S58	1,442	S57 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:40
S59	519	S58 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:43
S60	218	S59 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B) same (iron fe steel)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:43
S61	16,130	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S62	1,497	S61 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S63	551	S62 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S64	16,130	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR;	OR	ON	2021/03/29 12:49

			EPO; JPO; DERWENT			
S65	1,497	S64 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S66	551	S65 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S67	231	S66 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B) same (iron fe steel)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S68	0	("2021/0062288").URPN.	USPAT	OR	OFF	2021/03/29 12:55
S69	456	(("20190271058") or ("20190271056") or ("20190271055") or ("20170260603") or ("11041226") or ("10597747") or ("20190271057") or ("10577674") or ("10550447") or ("10590507") or ("20190276912") or ("10961602") or ("8307680") or ("20110165436") or ("9708683") or ("20130029172") or ("8733142") or ("8066829") or ("8440323") or ("20120064362") or ("20110214475") or ("20110006491") or ("20200263272") or ("20190153560") or ("10640842") or ("10619224") or ("10648055") or ("20190185959") or ("10669607") or ("20170268078") or ("20170016086") or ("20210214816") or ("20170298465") or ("9845518") or ("20170253941") or ("9611517") or ("8722203") or ("20100221572") or ("20140216612") or ("10131117") or ("9957582") or ("20170260599") or ("9909194") or ("20160017452") or ("20120085467") or ("9481916") or ("8721809") or ("20200399734") or ("20200190621") or ("20160289809") or ("20140212687") or ("20200385836") or ("20100026048") or ("20200149129") or ("20170341187") or ("20180100214") or ("20060130940") or ("9597750") or ("20170304952") or ("10828729") or ("10626903") or ("10480554") or ("20090220815") or ("20150152533") or	US-PGPUB; USPAT; USOCR	OR	OFF	2021/09/28 13:03

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S72	414	S71 and (S69 or S70)	US-PGPUB; USPAT; USOCR	OR	OFF	2021/09/28 13:06

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S41	5,246	(C21D9/46 B32B15/012 C23C2/12 C23C2/26 C23C2/40 Y10T428/12389 Y10T428/12396 Y10T428/12757).cpc.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S42	1,776	S41 and (aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S43	888	S41 and ((aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)).clm.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S44	136	S43 and ((interdiffusion intermediate intermetallic superficial) near3 layer).clm.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:47

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C:\Users\dschleis\Documents\EAST\Workspaces\17319306.wsp

Bibliographic Data

Application No: 17/319,306

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /Daniel J. Schleis/ (Examiner's Signature) [ ] (Initials)

Title: Coated Steel Strips, Coated Stamped Products and Methods

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FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/13/2021	428	1784	20631.1028CON7
RULE			

APPLICANTS

ArcelorMittal, Luxembourg, LUXEMBOURG

INVENTORS

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Dominique Spehner, Balan, FRANCE

Ronald Kefferstein, Saint Mitre Les Ramparts, FRANCE

CONTINUING DATA

This application is a CON of 16413825 05/16/2019 PAT 11041226

16413825 is a CON of 15606770 05/26/2017 PAT 10550447

15606770 is a CON of 13621015 09/15/2012 PAT 9708683

13621015 is a DIV of 12447777 03/18/2011 PAT 8307680

12447777 is a 371 of PCT/IB06/04019 10/30/2006

FOREIGN APPLICATIONS

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(Not for submission under 37 CFR 1.99)

Application Number	17319306
Filing Date	2021-05-13
First Named Inventor	Drillet
Art Unit	
Examiner Name	
Attorney Docket Number	20631.1028CON7

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	Filing Date	2021-05-13
	First Named Inventor	Drillet
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	1	"Hot-Dip Aluminised Sheet Metal fal AS," Production information re. fire-aluminized sheet metal, August 2007, published by ThyssenKrupp Steel, see English translation	
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EXAMINER SIGNATURE

Examiner Signature	/Daniel J. Schleis/	Date Considered	09/28/2021

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	Application Number	17319306
	Filing Date	2021-05-13
	First Named Inventor	Drillet
	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

CERTIFICATION STATEMENT

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	38156

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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(Not for submission under 37 CFR 1.99)

Application Number	17319306
Filing Date	2021-05-13
First Named Inventor	Pascal DRILLET
Art Unit	
Examiner Name	
Attorney Docket Number	20631.1028CON7

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	2	4257549	A	1981-03-24	ROBERTSON CO H H	
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	1	19749706	DE	C1	1999-03-04	MANNESMANN AG	See English Abstract and EPO machine translation	

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	Art Unit	
	Examiner Name	
	Attorney Docket Number	20631.1028CON7

	2	0724919	EP	A2	1996-08-07	HITACHI LTD	In English	
	3	1657004	EP	A1	2006-05-17	ARVEDI GIOVANNI	In English	
	4	2573226	CA	A1	2006-01-19	NIPPON STEEL CORP	In English	
	5	0692549	EP	A1	1996-01-17	UNITAS SA	In English	
	6	1063314	EP	A1	2000-12-27	KAWASAKI STEEL CO	In English	
	7	2720079	FR	A1	1995-11-24	LORRAINE LAMINAGE	See English Abstract and EPO machine translation	
	8	522697	AU	B2	1992-04-16	ARMCO INC	In English	
	9	H08144037	JP	A	1996-06-04	SUMITOMO METAL IND	See English Abstract and EPO machine translation	
	10	0724919	EP	A	2001-08-29	Nishi et al.	See US 5495736	
	11	1657004	EP	A1	2006-05-17	Giovanni et al.	In English	
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	1	Stahl und Eisen 120 (2000) Nr. 8, Seiten 51 bis 56, "Die neue Verzinkungsanlage 2 bei Eko Stahl", "The new No. 2 hot-dip galvanizing line at Eko Stahl", Autoren: Karl Döring, Jürgen Nathow, Dietrich Kern, Michael Breiter und Dietmar Lowenberg.	
	2	Andrews, K.W. Empirical Formulae for the Calculation of Some Transformation Temperatures. Journal of the Iron and Steel Institute, 203, Part 7, July 1965, 721-727.	
	3	Enlarged Fig. 7 of U.S. 16413825 (present application)	
	4	Low Carbon, Heat-Treatable Boron Steel - Uncoated or Aluminized PreCoated, GM Worldwide Engineering Standards, GMW14400.	
	5	Self-study programme 339, The Passat 2006	
	6	Kahl, Martin, "Some like it hot" Technology focus - Hot stamping, September/October 2004 AMS	
	7	Kolleck, R. et al., "Investigation on induction heating for hot stamping of boron alloyed steel" CIRP Annals - Manufacturing Technology 58, (2009), 275-278	
	8	Imose, Masayuki, "Heating and Cooling Technology in the Continuous Annealing" Transactions ISIJ, Vol. 25, 1985, 911-932	

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	9	Patent Trial and Appeal Board Final Decision in IPR2019-01275, US 9708683, dated January 5, 2021	
	10	Gokhale, Arun M., "Report on quantitative characterization of the microstructure of Aluminium alloy surface coating on hot-stamped US BOR 1500 steel blanks" School of Materials Science and Engineering, Georgia Institute of Technology, 13 May 2019	
	11	Fan, Dong Wei et al., "Formation of an Aluminide Coating on Hot Stamped Steel" ISIJ International, Vol. 50, No. 11, 2010, pp 1713-1718	
	12	Summons in EP proceeding for EP 09701846, dated 11/18/2016	
	13	Bourouga, Brahim, "Report on the heating of coated steel blanks for hot stamping" Laboratoire de therminque et enqerie de Nantes, 30 Aprill 2019	
	14	"Continuously hot-dip coated strip and sheet of strucutral steels - Technical delivery conditions," European Standard EN 10326, July 2004, NON-EN 10326	
	15	Webpages from Usinorauto.com: "Mechanical Properties (Continued)", May 20, 2003, downloaded from http://www.usinorauto.com/v-ang/produits/definitions4.htm	
	16	"Charakteristische Merkmale 095 - Schmelztauchveredeltes Band und Blech," Stahl-Informations-Zentrum, 2005, see partial translation.	
	17		

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Signature	/williamcgehris/	Date (YYYY-MM-DD)	2021-05-17
Name/Print	William C. Gehris	Registration Number	38,156

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L3      294483 0.1-0.5 SI/MAC
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        835563 0.01-1/MAC
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L4      135014 0.01-1 CR/MAC
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        593165 0-0.2/MAC
        210693 TI/MAC
L5       73886 0-0.2 TI/MAC
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=> search 0-0.1 al/mac

        465880 0-0.1/MAC
        388223 AL/MAC
L6       52233 0-0.1 AL/MAC
                (0-0.1/MAC (P) AL/MAC)

=> search 0-0.1 p/mac

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L7       39018 0-0.1 P/MAC
                (0-0.1/MAC (P) P/MAC)

=> search 0-0.05 s/mac
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         34336 S/MAC
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        109559 B/MAC
L9        5672 0.0005-0.08 B/MAC
                (0.0005-0.08/MAC (P) B/MAC)

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L10     742182 FE/MAC

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L13         18 L11 AND (STEEL)

=> search l12 and (steel)

          1060 L12
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       1417345 STEEL
        222617 STEELS
       1431969 STEEL
                 (STEEL OR STEELS)
L14         999 L12 AND (STEEL)

=> search l12 and (steel) and (coat or coating or coated or layer or laminate)

          1060 L12
       1417345 STEEL
        222617 STEELS
       1431969 STEEL
                 (STEEL OR STEELS)
        116120 COAT
         23934 COATS
        133770 COAT
                 (COAT OR COATS)
       1905045 COATING
        604881 COATINGS
       2007219 COATING
                 (COATING OR COATINGS)
       1016515 COATED
             2 COATEDS
       1016517 COATED
                 (COATED OR COATEDS)
       3494053 LAYER
       1195366 LAYERS
       4044337 LAYER
                 (LAYER OR LAYERS)
        171804 LAMINATE
         92348 LAMINATES
        202644 LAMINATE
                 (LAMINATE OR LAMINATES)
L15         168 L12 AND (STEEL) AND (COAT OR COATING OR COATED OR LAYER OR LAMIN
                ATE)

=> display ibib abs retable hitstr hitind l13 1-18


L13  ANSWER 1 OF 18  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2021:1204659  CAPLUS Full-text
DOCUMENT NUMBER:          175:102969
TITLE:                    Coated thermoformed component having excellent
                          properties and manufacture method thereof
INVENTOR(S):              Tan, Ning; Liu, Junxiang; Huang, Caigen; Jiang, Lei;
                          Wang, Chao
PATENT ASSIGNEE(S):       Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE:                   PCT Int. Appl., 21pp.; Chemical Indexing Equivalent to
                          175:125385 (CN)
                          CODEN: PIXXD2
DOCUMENT TYPE:            Patent
LANGUAGE:                 Chinese
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    --------------------     --------
     WO 2021104462         A1   20210603    WO 2020-CN132307         20201127
     CN 112877590          A    20210601    CN 2019-11201470         20191129
PRIORITY APPLN. INFO.:                     CN 2019-11201470      A  20191129
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     WO 2021104462         A1   Alive           20210610
     CN 112877590          A    Alive           20210610
AB   The thermoformed component comprises a substrate and a coating thereon.
     The substrate comprises the following ingredients in percentage by wt.:
     0.01-0.8% of C, 0.05-1.0% of Si, 0.1-5% of Mn, 0.001-0.3% of P, 0.001-0.1%
     of S, 0.001-0.3% of Al, 0.001-0.5% of Ti, 0.0005-0.1% of B, 0.001-0.5% of
     Nb, 0.001-0.5% of V, and the remainder being Fe and other unavoidable
     impurities.  The appearance of the thermoformed component has no color
     difference and no mottling.  The surface oxygen content of the
     thermoformed component is 0.1-20wt.%, and the ratio of the std. deviation
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to the av. value of the surface oxygen content satisfies: 0 < std. deviation of oxygen content / av. value of oxygen content ≤ 0.3. In the manufg. method, a coated steel plate that has undergone heat treatment, transfer processing, and hot stamping is not treated with oil.

IT 2648457-02-5
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; coated thermoformed component having excellent properties and manuf. method thereof)

RN 2648457-02-5 CAPLUS

CN Iron alloy, base, Fe 90-100,Mn 0.1-5,Si 0-1,Cr 0.2-0.8,C 0-0.8,Nb 0-0.5,Ti 0-0.5,V 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	90 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Si	0 - 1	7440-21-3
Cr	0.2 - 0.8	7440-47-3
C	0 - 0.8	7440-44-0
Nb	0 - 0.5	7440-03-1
Ti	0 - 0.5	7440-32-6
V	0 - 0.5	7440-62-2
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI C23C0002-12 [I]; C23C0002-40 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C21D0001-26 [I]; C21D0008-00 [I]; B21D0022-02 [I]

IPCR C23C0002-12 [I]; B21D0022-02 [I]; C21D0001-26 [I]; C21D0008-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C23C0002-40 [I]

CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 73

IT 2648457-02-5
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; coated thermoformed component having excellent properties and manuf. method thereof)

L13 ANSWER 2 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2020:2453019 CAPLUS Full-text

DOCUMENT NUMBER: 174:38459

TITLE: Manufacture of welded components made of a deformed high-strength steel

INVENTOR(S): Otto, Manuel

PATENT ASSIGNEE(S): Salzgitter Flachstahl GmbH, Germany

SOURCE: Ger. Offen., 15pp.; Chemical Indexing Equivalent to 174:38458 (WO)
CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102019114090	A1	20201203	DE 2019-102019114090	20190527
WO 2020239671	A1	20201203	WO 2020-EP64399	20200525

PRIORITY APPLN. INFO.: DE 2019-102019114090 A 20190527

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102019114090	A1	Alive	20201203
WO 2020239671	A1	Alive	20201210

AB A method for producing a welded component achieves mech. properties in the welding seam region, in particular fatigue strength, comparable to those in the non-influenced base material, preferably even with a higher degree of strength than in the base material. This method comprises: producing a hot-rolled steel product made of a high-strength air-hardenable steel with a material thickness ≥1.5 mm, the hot-rolled steel product

contg., by wt.%: C: 0.03-0.4, preferably 0.08-0.1; Mn: 1-4, preferably 1.8-2; Si: 0.09-2, preferably 0.25-0.3; Al: 0.02-2, preferably 0.02-0.05; P 0-0.1, preferably ≤0.020; S 0-0.1, preferably ≤ 0.01; N: 0.001-0.5, preferably 0.003-0.008; Ti: 0.01-0.2, preferably 0.02-0.03; Cr: 0.05-2, preferably 0.7-0.8; B: 0.001-0.1, preferably 0.0025-0.0035; Mo: 0.01-1, preferably 0.15-0.3; V: 0.01-0.2, preferably 0.05-0.08; optionally: Ni: 0.02-1; Nb: 0.01-0.1; and balance in iron including conventional steel-accompanying elements; air hardening the produced hot-rolled steel product; then deforming the hot-rolled steel product in the air-hardened state to form a component; and producing welding connections using a fusion welding process on the component.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 10023488 A1	CAPLUS
Anon				DE 102004053620 A1	CAPLUS
Anon				WO 2011000351 A1	CAPLUS
Anon				DE 4446709 A1	CAPLUS

IT 2550686-17-2P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(manuf. of welded components made of a deformed high-strength steel)

RN 2550686-17-2 CAPLUS

CN Iron alloy, base, Fe 86-99,Mn 1-4,Si 0.1-2,Al 0-2,Cr 0-2,Mo 0-1,Ni 0-1,N 0-0.5,C 0-0.4,Ti 0-0.2,V 0-0.2,B 0-0.1,Nb 0-0.1,P 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	86 - 99	7439-89-6
Mn	1 - 4	7439-96-5
Si	0.1 - 2	7440-21-3
Al	0 - 2	7429-90-5
Cr	0 - 2	7440-47-3
Mo	0 - 1	7439-98-7
Ni	0 - 1	7440-02-0
N	0 - 0.5	17778-88-0
C	0 - 0.4	7440-44-0
Ti	0 - 0.2	7440-32-6
V	0 - 0.2	7440-62-2
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9

IPCI C21D0008-00 [I]; C22C0038-04 [I]
IPCR C21D0008-00 [I]; C22C0038-04 [I]
CC 55-9 (Ferrous Metals and Alloys)
ST welding deformation strength steel rolling
IT Automobile bodies
(chassis; manuf. of welded components made of a deformed high-strength steel)
IT Welding of metals
(gas metal-arc welding; manuf. of welded components made of a deformed high-strength steel)
IT Appliances
Automotive bumpers
Deep drawing of materials
Elongation at break
Forging
Hot rolling
Laser welding
Metalworking
Yield strength
(manuf. of welded components made of a deformed high-strength steel)
IT 12427-23-5, Bainite
RL: FMU (Formation, unclassified); PRP (Properties); FORM (Formation, nonpreparative)

(manuf. of welded components made of a deformed high-strength steel)
IT 2550686-17-2P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(manuf. of welded components made of a deformed high-strength steel)

L13 ANSWER 3 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:2453018 CAPLUS Full-text
DOCUMENT NUMBER: 174:38458
TITLE: Manufacture of welded components made of a deformed high-strength steel
INVENTOR(S): Otto, Manuel
PATENT ASSIGNEE(S): Salzgitter Flachstahl GmbH, Germany
SOURCE: PCT Int. Appl., 32pp.; Chemical Indexing Equivalent to 174:38459 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2020239671	A1	20201203	WO 2020-EP64399	20200525
DE 102019114090	A1	20201203	DE 2019-102019114090	20190527

PRIORITY APPLN. INFO.: DE 2019-102019114090 A 20190527
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020239671	A1	Alive	20201210
DE 102019114090	A1	Alive	20201203

AB A method for producing a welded component achieves mech. properties in the welding seam region, in particular fatigue strength, comparable to those in the non-influenced base material, preferably even with a higher degree of strength than in the base material. This method comprises: producing a hot-rolled steel product made of a high-strength air-hardenable steel with a material thickness ≥1.5 mm, the hot-rolled steel product contg., by wt.%: C: 0.03-0.4, preferably 0.08-0.1; Mn: 1-4, preferably 1.8-2; Si: 0.09-2, preferably 0.25-0.3; Al: 0.02-2, preferably 0.02-0.05; P 0-0.1, preferably ≤0.020; S 0-0.1, preferably ≤ 0.01; N: 0.001-0.5, preferably 0.003-0.008; Ti: 0.01-0.2, preferably 0.02-0.03; Cr: 0.05-2, preferably 0.7-0.8; B: 0.001-0.1, preferably 0.0025-0.0035; Mo: 0.01-1, preferably 0.15-0.3; V: 0.01-0.2, preferably 0.05-0.08; optionally: Ni: 0.02-1; Nb: 0.01-0.1; and balance in iron including conventional steel-accompanying elements; air hardening the produced hot-rolled steel product; then deforming the hot-rolled steel product in the air-hardened state to form a component; and producing welding connections using a fusion welding process on the component.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	2009			KR 20090103779 A	
BANGARU NARASIMHA-RAO V	1999			WO 9905336 A1	CAPLUS
HANSEN STEVEN S	2007			US 20070267110 A1	CAPLUS
HARA TAKUYA	2014			US 8715430 B2	CAPLUS
PAN HUI	2019			CN 109136762 A	CAPLUS
PAN HUI	2019			CN 109402499 A	CAPLUS
SCHOETTLER JOACHIM	2009			DE 102007058222 A1	CAPLUS
SCHOTTLER JOACHIM	2017			DE 102016104295 A1	CAPLUS
VON HAGEN INGO	1999			WO 9928518 A1	CAPLUS

IT 2550686-17-2P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(manuf. of welded components made of a deformed high-strength steel)
RN 2550686-17-2 CAPLUS
CN Iron alloy, base, Fe 86-99,Mn 1-4,Si 0.1-2,Al 0-2,Cr 0-2,Mo 0-1,Ni 0-1,N 0-0.5,C 0-0.4,Ti 0-0.2,V 0-0.2,B 0-0.1,Nb 0-0.1,P 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	86 - 99	7439-89-6
Mn	1 - 4	7439-96-5
Si	0.1 - 2	7440-21-3
Al	0 - 2	7429-90-5
Cr	0 - 2	7440-47-3
Mo	0 - 1	7439-98-7
Ni	0 - 1	7440-02-0
N	0 - 0.5	17778-88-0
C	0 - 0.4	7440-44-0
Ti	0 - 0.2	7440-32-6
V	0 - 0.2	7440-62-2
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9

IPCI C21D0008-04 [I]; B23K0009-23 [I]; C22C0038-00 [I]; C22C0038-02 [I];
C22C0038-06 [I]; C22C0038-22 [I]; C22C0038-24 [I]; C22C0038-26 [I];
C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C22C0038-44 [I];
C22C0038-46 [I]; C22C0038-50 [I]; C22C0038-54 [I]
IPCR C21D0008-04 [I]; B23K0009-23 [I]; C22C0038-00 [I]; C22C0038-02 [I];
C22C0038-06 [I]; C22C0038-22 [I]; C22C0038-24 [I]; C22C0038-26 [I];
C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C22C0038-44 [I];
C22C0038-46 [I]; C22C0038-50 [I]; C22C0038-54 [I]
CC 55-9 (Ferrous Metals and Alloys)
ST welding deformation strength steel rolling
IT Automobile bodies
(chassis; manuf. of welded components made of a deformed high-strength steel)
IT Welding of metals
(gas metal-arc welding; manuf. of welded components made of a deformed high-strength steel)
IT Appliances
Automotive bumpers
Deep drawing of materials
Elongation at break
Forging
Hot rolling
Laser welding
Metalworking
Yield strength
(manuf. of welded components made of a deformed high-strength steel)
IT 12427-23-5, Bainite
RL: FMU (Formation, unclassified); PRP (Properties); FORM (Formation, nonpreparative)
(manuf. of welded components made of a deformed high-strength steel)
IT 2550686-17-2P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(manuf. of welded components made of a deformed high-strength steel)

L13 ANSWER 4 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:1995137 CAPLUS Full-text
DOCUMENT NUMBER: 173:735842
TITLE: Aluminum or aluminum alloy plated steel differential strength welded part and its manufacture
INVENTOR(S): Pan, Hua; Liu, Chengjie; Lei, Ming; Wu, Yue; Sun, Zhongqu; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: PCT Int. Appl., 27pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
WO 2020200110	A1	20201008	WO 2020-CN81743		20200327
CN 111215751	A	20200602	CN 2019-10249188		20190329
EP 3815837	A1	20210505	EP 2020-785301		20200327
PRIORITY APPLN. INFO.:			CN 2019-10249188	A	20190329
			WO 2020-CN81743	W	20200327

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020200110	A1	Alive	20201203
CN 111215751	A	Alive	20201120
EP 3815837	A1	Alive	20210506

AB The different-strength steel welding component is formed by means of butt welding of a high-strength steel plate and a low-strength steel plate, and each of the high-strength steel plate and the low-strength steel plate comprises a base body and at least one pure aluminum or aluminum-alloy plating on a surface of the base body. The components of the base body of the high-strength steel plate, in percentages by wt., are: 0.08-0.8% of C, 0.05-1.0% of Si, 0.1-5% of Mn, P < 0.3%, S < 0.1%, Al < 0.3%, Ti < 0.5%, 0.0005-0.1% of B, 0.01-3% of Cr, and the remaining components are Fe and inevitable impurities. The components of the base body of the low-strength steel plate, in percentages by wt., are: 0.03-0.1% of C, 0-0.3% of Si, 0.5-2.0% of Mn, P < 0.1%, S < 0.05%, Al < 0.1%, 0-0.1% of Cr, 0-0.05% of Ti, and the remaining components are Fe and inevitable impurities. The tensile strength of a welding seam of the welding component after hot stamping is greater than the tensile strength of a low-strength steel base metal, and the elongation is greater than 4%, such that application requirements of the welding component in the field of automobile hot stamping are met. The present invention also relates to a method for manufg. a different-strength steel welding component with an aluminum or aluminum-alloy plating, a different-strength steel welding component with an aluminum or aluminum-alloy plating that is prepd. by means of the method, and a welding wire used in the method.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
ALIPS PHILIPPE	2004			US 20040200813 A1	
BECKER JENS-ULRIK	2017			CN 106794671 A	CAPLUS
GARCIA MICHEL	2015			CN 105163895 A	CAPLUS
GU HONGPING	2017			CN 106687248 A	CAPLUS
LUZIUS SEVERIN	2015			US 20150034615 A1	
PAN HUA	2017			CN 106334875 A	CAPLUS
WANG XIAONAN	2018			CN 108838541 A	CAPLUS

IT 2067242-22-0
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-26 [I]; B23K0026-322 [I]; B23K0026-12 [I]; C22C0038-38 [I]; C22C0038-32 [I]; C22C0038-28 [I]; C22C0038-06 [I]; C22C0038-04 [I]; C22C0038-02 [I]

IPCR B23K0026-26 [I]; B23K0026-12 [I]; B23K0026-322 [I]; C22C0038-02 [I];
C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I];
C22C0038-38 [I]
CC 55-9 (Ferrous Metals and Alloys)
ST aluminum alloy plated steel differential strength welded part
IT Laser welding
Plating process
Tensile strength
Welds
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)
IT Welding of metals
(gas metal-arc welding; aluminum or aluminum alloy plated steel
differential strength welded part and its manuf.)
IT 2067242-22-0 2498542-24-6, C 0.03-0.1, Si 0-0.3, Mn 0.5-2, Al
0-0.1, Cr 0-0.1, Fe bal., processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
(Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)
IT 2490151-16-9, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or
engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)
IT 7429-90-5, Aluminum, uses 2087430-39-3, Si 5-11, Fe 0-4, Al bal.
RL: TEM (Technical or engineered material use); USES (Uses)
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)

L13 ANSWER 5 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:1945589 CAPLUS Full-text
DOCUMENT NUMBER: 173:612896
TITLE: Production of hot-rolled steel material composite with various properties, suppressed uncontrolled deformation, and easier further processing
INVENTOR(S): Wolske, Vanessa; Vetter, Tobias; Fechte-Heinen, Rainer; Becker, Jens-Ulrik
PATENT ASSIGNEE(S): ThyssenKrupp Steel Europe AG, Germany
SOURCE: PCT Int. Appl., 30pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2020193531	A1	20201001	WO 2020-EP58125	20200324
PRIORITY APPLN. INFO.:			DE 2019-102019204324 A	20190328

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020193531	A1	Alive	20201203

AB This invention discloses a method to produce a hot-rolled steel material composite with suppressed uncontrolled deformation during hot rolling and easier further processing.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1980			JP 5570490 A	
BALKENHOL MICHAEL	2016			DE 102014111625 A1	
BENJAMIN LIEBOWITZ	1949			US 2474682 A	CAPLUS
ETZLSTORFER CHRISTOPH	2017			EP 3241675 A1	CAPLUS

IT 2490282-01-2 2490282-02-3
RL: TEM (Technical or engineered material use); USES (Uses)
(prodn. of hot-rolled steel material composite with various properties, suppressed uncontrolled deformation, and easier further processing)
RN 2490282-01-2 CAPLUS
CN Iron alloy, base, Fe 92-100,Ni 0-1.8,Mn 0.3-1.5,Cr 0-1,Si 0-0.8,Mo 0-0.5,C

0.1-0.4,Cu 0-0.3,Al 0-0.2,Nb 0-0.2,Ti 0-0.2,V 0-0.2,As 0-0.1,B 0-0.1,Ca 0-0.1,N 0-0.1,P 0-0.1,S 0-0.1,Sn 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	92 - 100	7439-89-6
Ni	0 - 1.8	7440-02-0
Mn	0.3 - 1.5	7439-96-5
Cr	0 - 1	7440-47-3
Si	0 - 0.8	7440-21-3
Mo	0 - 0.5	7439-98-7
C	0.1 - 0.4	7440-44-0
Cu	0 - 0.3	7440-50-8
Al	0 - 0.2	7429-90-5
Nb	0 - 0.2	7440-03-1
Ti	0 - 0.2	7440-32-6
V	0 - 0.2	7440-62-2
As	0 - 0.1	7440-38-2
B	0 - 0.1	7440-42-8
Ca	0 - 0.1	7440-70-2
N	0 - 0.1	17778-88-0
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9
Sn	0 - 0.1	7440-31-5

RN 2490282-02-3 CAPLUS
CN Iron alloy, base, Fe 92-99,Cr 0-2,Mn 0.3-1.5,C 0.4-0.9,Si 0-0.8,Ni 0-0.5,V 0-0.5,Cu 0-0.3,Mo 0-0.3,Al 0-0.2,Nb 0-0.2,As 0-0.1,B 0-0.1,Ca 0-0.1,N 0-0.1,P 0-0.1,S 0-0.1,Sn 0-0.1,Ti 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	92 - 99	7439-89-6
Cr	0 - 2	7440-47-3
Mn	0.3 - 1.5	7439-96-5
C	0.4 - 0.9	7440-44-0
Si	0 - 0.8	7440-21-3
Ni	0 - 0.5	7440-02-0
V	0 - 0.5	7440-62-2
Cu	0 - 0.3	7440-50-8
Mo	0 - 0.3	7439-98-7
Al	0 - 0.2	7429-90-5
Nb	0 - 0.2	7440-03-1
As	0 - 0.1	7440-38-2
B	0 - 0.1	7440-42-8
Ca	0 - 0.1	7440-70-2
N	0 - 0.1	17778-88-0
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9
Sn	0 - 0.1	7440-31-5
Ti	0 - 0.1	7440-32-6

IPCI B32B0015-01 [I]; C22C0038-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]; B21D0035-00 [I]; B23K0020-04 [I]; B23K0020-227 [I]; B23K0020-24 [I]; B23K0026-38 [I]; B23K0026-40 [I]; B23K0033-00 [I]; B23K0103-04 [I]; B23K0103-18 [I]; B21B0001-00 [I]
IPCR B32B0015-01 [I]; B21B0001-00 [I]; B21D0035-00 [I]; B23K0020-04 [I]; B23K0020-227 [I]; B23K0020-24 [I]; B23K0026-38 [I]; B23K0026-40 [I]; B23K0033-00 [I]; B23K0103-04 [N]; B23K0103-18 [N]; C22C0038-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]
CC 56-11 (Nonferrous Metals and Alloys)
ST hot rolled steel composite
IT Composites
Heating
Hot rolling
(prodn. of hot-rolled steel material composite with various properties, suppressed uncontrolled deformation, and easier further processing)
IT 12597-69-2, Steel, uses 2490282-01-2
2490282-02-3

RL: TEM (Technical or engineered material use); USES (Uses)
(prodn. of hot-rolled steel material composite with various properties, suppressed uncontrolled deformation, and easier further processing)

L13 ANSWER 6 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:1041904 CAPLUS Full-text
DOCUMENT NUMBER: 173:612711
TITLE: Aluminum or aluminum alloy plated steel differential strength welded part and its manufacture
INVENTOR(S): Pan, Hua; Liu, Chengjie; Lei, Ming; Wu, Yue; Sun, Zhongqu; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 12pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 111215751	A	20200602	CN 2019-10249188	20190329
WO 2020200110	A1	20201008	WO 2020-CN81743	20200327
EP 3815837	A1	20210505	EP 2020-785301	20200327
PRIORITY APPLN. INFO.:			CN 2019-10249188 A	20190329
			WO 2020-CN81743 W	20200327

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 111215751	A	Alive	20201120
WO 2020200110	A1	Alive	20201203
EP 3815837	A1	Alive	20210506

AB The invention discloses a steel differential strength welding part with an aluminum or aluminum alloy coating and a manufg. method thereof, wherein the steel differential strength welding part is formed by butt welding a high-strength steel plate and a low-strength steel plate, and the high-strength steel plate and the low-strength steel plate comprise a substrate and at least one of the surfaces of the substrate and the substrate is a pure aluminum or aluminum alloy coating; the high-strength steel plate matrix comprises the following components in percentage by wt.: c 0.08-0.8%, Si 0.05-1.0%, Mn 0.1-5%, P <0.3%, S <0.1%, Al <0.3%, Ti <0.5%, B 0.0005-0.1%, Cr 0.01-3%, residual Fe and inevitable impurities; the low-strength steel plate matrix comprises the following components in percentage by wt.: c 0.03-0.1%, Si 0-0.1%, Mn 1.0-2.0%, P <0.1%, S <0.05%, Al <0.1%, Cr 0-0.1%, Ti 0-0.05%, balance of Fe and inevitable impurities. The tensile strength of the welded part after hot stamping is greater than that of a low-strength steel base metal, the elongation is greater than 4%, and the application requirements of the welded part in the field of automobile hot stamping are met.
IT 2067242-22-0, C 0.08-0.8, Si 0.05-1, Mn 0.1-5, P 0-0.3, S 0-0.1, Al 0-0.3, Ti 0-0.5, B 0.0005-0.1, Cr 0.01-3, Fe bal.
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)
RN 2067242-22-0 CAPLUS
CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8

```
    S       0   -   0.1      7704-34-9

IPCI B23K0026-26; B23K0026-322; B23K0026-12; C22C0038-38; C22C0038-32;
     C22C0038-28; C22C0038-06; C22C0038-04; C22C0038-02
IPCR B23K0026-26 [I]; B23K0026-12 [I]; B23K0026-322 [I]; C22C0038-02 [I];
     C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I];
     C22C0038-38 [I]
CC   55-9 (Ferrous Metals and Alloys)
ST   r aluminum alloy plated steel differential strength welded part
IT   Laser welding
     Plating process
     Tensile strength
     Welds
        (aluminum or aluminum alloy plated steel differential
        strength welded part and its manuf.)
IT   Welding of metals
        (gas metal-arc welding; aluminum or aluminum alloy plated steel
        differential strength welded part and its manuf.)
IT   2067242-22-0, C 0.08-0.8, Si 0.05-1, Mn 0.1-5, P 0-0.3, S 0-0.1,
     Al 0-0.3, Ti 0-0.5, B 0.0005-0.1, Cr 0.01-3, Fe bal.   2490151-15-8, C
     0.03-0.1, Si 0-0.1, Mn 0.5-2, Al 0-0.1, Cr 0-0.1, Fe bal., processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (aluminum or aluminum alloy plated steel differential
        strength welded part and its manuf.)
IT   2490151-16-9, C 0.1-0.25, Si 0.2-0.4, Mn 1.2-2, Al 0-0.06, Ti 0.02-0.08,
     Cr 0.05-0.2, Fe bal., processes
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (aluminum or aluminum alloy plated steel differential
        strength welded part and its manuf.)
IT   7429-90-5, Aluminum, uses   1273096-81-3, Aluminum alloy
     RL: TEM (Technical or engineered material use); USES (Uses)
        (aluminum or aluminum alloy plated steel differential
        strength welded part and its manuf.)


L13  ANSWER 7 OF 18  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2019:805627  CAPLUS Full-text
DOCUMENT NUMBER:          170:527030
TITLE:                    Enamelling of high-strength steels
INVENTOR(S):              Myslowicki, Stefan
PATENT ASSIGNEE(S):       ThyssenKrupp Steel Europe AG, Germany; ThyssenKrupp AG
SOURCE:                   PCT Int. Appl., 28pp.; Chemical Indexing Equivalent to
                          170:527029 (DE)
                          CODEN: PIXXD2
DOCUMENT TYPE:            Patent
LANGUAGE:                 German
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     WO 2019076717         A1   20190425    WO 2018-EP77686          20181011
     DE 102017218434       A1   20190418    DE 2017-102017218434     20171016
     EP 3697545            A1   20200826    EP 2018-786281           20181011
PRIORITY APPLN. INFO.:                      DE 2017-102017218434 A   20171016
                                            WO 2018-EP77686      W   20181011
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     WO 2019076717         A1   Alive           20201219
     DE 102017218434       A1   Dead            20210715
     EP 3697545            A1   Dead            20210820
AB   A shaped part having at least two layers, comprises at least one layer
     made of high-strength steel with a tensile strength ≥500 MPa and
     a hardness ≥160 HV, and at least one layer made of a steel that
     has an enamel layer on the outer side.  The shaped part are suitable for
     producing pipelines, pressure vessels, reactors or in app. engineering, in
     particular for the transport of aq. and/or corrosive media.
IT   2306234-82-0P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
```

(enamelling of high-strength steels)
RN 2306234-82-0 CAPLUS
CN Iron alloy, base, Fe 85-99,Mn 0.5-3,Al 0-3,Si 0.1-2.5,P 0-1.5,Cr 0-1,Mo 0-1,V 0-1,Ti 0-0.8,Nb 0-0.5,C 0-0.4,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	85 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Al	0 - 3	7429-90-5
Si	0.1 - 2.5	7440-21-3
P	0 - 1.5	7723-14-0
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
Ti	0 - 0.8	7440-32-6
Nb	0 - 0.5	7440-03-1
C	0 - 0.4	7440-44-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B21B0001-38 [I]; C21D0008-02 [I]; C21D0009-46 [I]; C22C0038-02 [I]; C23D0005-00 [I]
IPCR B21B0001-38 [I]; C21D0008-02 [I]; C21D0009-46 [I]; C22C0038-02 [I]; C23D0005-00 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST enamel strength steel bilayer
IT Enameling
Enamels (vitreous)
Pipelines
Pressure vessels
Reactors
(enamelling of high-strength steels)
IT 2306234-83-1P, preparation
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enameled; enamelling of high-strength steels)
IT 12597-69-2P, Steel, preparation 59816-66-9P, preparation
2306234-82-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enamelling of high-strength steels)

L13 ANSWER 8 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:746016 CAPLUS Full-text
DOCUMENT NUMBER: 170:527029
TITLE: Enamelling of high-strength steels
INVENTOR(S): Myslowicki, Stefan
PATENT ASSIGNEE(S): ThyssenKrupp AG, Germany; ThyssenKrupp Steel Europe AG
SOURCE: Ger. Offen., 20pp.; Chemical Indexing Equivalent to 170:527030 (WO)
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102017218434	A1	20190418	DE 2017-102017218434	20171016
WO 2019076717	A1	20190425	WO 2018-EP77686	20181011
EP 3697545	A1	20200826	EP 2018-786281	20181011
PRIORITY APPLN. INFO.:			DE 2017-102017218434 A	20171016
			WO 2018-EP77686 W	20181011

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102017218434	A1	Dead	20210715
WO 2019076717	A1	Alive	20201219
EP 3697545	A1	Dead	20210820

AB A shaped part having at least two layers, comprises at least one layer made of high-strength steel with a tensile strength ≥500 MPa and a hardness ≥160 HV, and at least one layer made of a steel that has an enamel layer on the outer side. The shaped part are suitable for producing pipelines, pressure vessels, reactors or in app. engineering, in particular for the transport of aq. and/or corrosive media.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 102008022709 A1	CAPLUS
Anon				DE 1533303 C2	
Anon				EP 2227574 B1	CAPLUS

IT 2306234-82-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enamelling of high-strength steels)

RN 2306234-82-0 CAPLUS

CN Iron alloy, base, Fe 85-99,Mn 0.5-3,Al 0-3,Si 0.1-2.5,P 0-1.5,Cr 0-1,Mo 0-1,V 0-1,Ti 0-0.8,Nb 0-0.5,C 0-0.4,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	85 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Al	0 - 3	7429-90-5
Si	0.1 - 2.5	7440-21-3
P	0 - 1.5	7723-14-0
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
Ti	0 - 0.8	7440-32-6
Nb	0 - 0.5	7440-03-1
C	0 - 0.4	7440-44-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI C23D0005-00 [I]; B23K0020-04 [I]
IPCR C23D0005-00 [I]; B23K0020-04 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST enamel strength steel bilayer
IT Enameling
Enamels (vitreous)
Pipelines
Pressure vessels
Reactors
(enamelling of high-strength steels)
IT 2306234-83-1P, preparation
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enameled; enamelling of high-strength steels)
IT 12597-69-2P, Steel, preparation 59816-66-9P, preparation
2306234-82-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enamelling of high-strength steels)

L13 ANSWER 9 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:570060 CAPLUS Full-text
DOCUMENT NUMBER: 170:493791
TITLE: Method for manufacturing hot stamped parts with aluminum-silicon alloy coating and hot stamped parts
INVENTOR(S): Tan, Ning; Fu, Jiang; Hong, Jiyao; Fang, Xuehua
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 13pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
CN 109518114	A	20190326	CN 2018-11035118		20180906
WO 2020030200	A1	20200213	WO 2019-CN104708		20190906
EP 3770295	A1	20210127	EP 2019-847997		20190906
US 20210252579	A1	20210819	US 2020-17049547		20201021
PRIORITY APPLN. INFO.:			CN 2018-10896744	A	20180808
			CN 2018-11035118	A	20180906
			WO 2019-CN104708	W	20190906

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 109518114	A	Alive	20201121
WO 2020030200	A1	Alive	20201219
EP 3770295	A1	Alive	20210128
US 20210252579	A1	Alive	20210826

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The title method comprises the following steps of: processing steel plate coated with aluminum-silicon alloy coating to form a blank of a desired shape of the part, heat treating the blank, and hot stamping. The blank heat treatment adopts two-stage or three-stage heating and heat preservation, and the heating and heat preservation are stepwise heating. The steel plate coated with aluminum-silicon alloy coating include a substrate and an aluminum-silicon alloy coating on at least one surface thereof. The method fully considers the characteristics of the aluminum-silicon coating, is able to effectively solve the problem of roll banding of the aluminum-silicon coating, reduces the nodulation probability of the roller of the heat treatment furnace, improves the service life of the roller, and ensures the integrity of the coating of the hot stamped part as well as the mech. property, welding property, coating property and corrosion resisting property of the part.

IT 2305367-85-3P, Aluminum 0-0.3, boron 0-0.1, carbon 0.04-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1.2, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(method for manufg. hot stamped parts with aluminum-silicon alloy coating and hot stamped parts)

RN 2305367-85-3 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1.2,C 0-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1.2	7440-21-3
C	0 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI C23C0002-12; C23C0002-40; C22C0038-02; C22C0038-04; C22C0038-06; C22C0038-28; C22C0038-32; C22C0038-38; C21D0001-26; C21D0008-00; B21D0022-02

IPCR C23C0002-12 [I]; B21D0022-02 [I]; C21D0001-26 [I]; C21D0008-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C23C0002-40 [I]

CC 56-11 (Nonferrous Metals and Alloys)

ST hot stamping steel aluminum silicon coating

IT 2305367-85-3P, Aluminum 0-0.3, boron 0-0.1, carbon 0.04-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1.2, sulfur 0-0.1, titanium 0-0.5, iron bal. 2305367-88-6P, Iron 0-4, silicon 4-14, aluminum bal.
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(method for manufg. hot stamped parts with aluminum-silicon alloy

coating and hot stamped parts)

L13 ANSWER 10 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:2321302 CAPLUS Full-text
DOCUMENT NUMBER: 170:49880
TITLE: Steel-based electromagnetic shield multilayer screen products
INVENTOR(S): Wieschalla, Vanessa; Nierhoff, Daniel; Wolske, Vanessa; Becker, Jens-Ulrik
PATENT ASSIGNEE(S): ThyssenKrupp AG, Germany; ThyssenKrupp Steel Europe AG
SOURCE: Ger., 17pp.
CODEN: GWXXAW
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102017216975	B3	20181129	DE 2017-102017216975	20170925
WO 2019057547	A1	20190328	WO 2018-EP74424	20180911

PRIORITY APPLN. INFO.: DE 2017-102017216975 A 20170925
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102017216975	B3	Alive	20201121
WO 2019057547	A1	Alive	20201203

AB An electromagnetic radiation shielding multilayer material is manufd. for shielding from electromagnetic radiation, static elec. and/or static magnetic fields.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				EP 1426982 A1	CAPLUS
Anon				WO 1991012960 A1	
Anon				DE 3710322 A1	CAPLUS

IT 2253656-70-9P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(layers; steel-based electromagnetic shield multilayer screen products)
RN 2253656-70-9 CAPLUS
CN Iron alloy, base, Fe 94-100,Mn 0.1-3,C 0-0.5,Cr 0-0.5,Cu 0-0.5,Si 0-0.5,Ti 0-0.3,Ni 0-0.2,Al 0-0.1,As 0-0.1,B 0-0.1,Mo 0-0.1,N 0-0.1,Nb 0-0.1,P 0-0.1,S 0-0.1,Sn 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 100	7439-89-6
Mn	0.1 - 3	7439-96-5
C	0 - 0.5	7440-44-0
Cr	0 - 0.5	7440-47-3
Cu	0 - 0.5	7440-50-8
Si	0 - 0.5	7440-21-3
Ti	0 - 0.3	7440-32-6
Ni	0 - 0.2	7440-02-0
Al	0 - 0.1	7429-90-5
As	0 - 0.1	7440-38-2
B	0 - 0.1	7440-42-8
Mo	0 - 0.1	7439-98-7
N	0 - 0.1	17778-88-0
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9
Sn	0 - 0.1	7440-31-5
V	0 - 0.1	7440-62-2

IPCI C22C0038-02 [I]; H05K0009-00 [I]; C22C0038-04 [I]; C22C0038-18 [I]
IPCR C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-18 [I]; H05K0009-00 [I]
CC 55-3 (Ferrous Metals and Alloys)

Section cross-reference(s): 73, 76, 77
ST multilayer screen electromagnetic shield stainless steel alloy
IT Electromagnetic shields
Hot rolling
Multilayers
(steel-based electromagnetic shield multilayer screen products)
IT 2253656-70-9P 2253656-71-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(layers; steel-based electromagnetic shield multilayer screen products)

L13 ANSWER 11 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:863056 CAPLUS Full-text
DOCUMENT NUMBER: 168:486049
TITLE: Steel welding part with aluminum or aluminum alloy plating layer and manufacture method thereof
INVENTOR(S): Pan, Hua; Su, Yongchao; Lei, Ming; Shi, Lei; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: PCT Int. Appl., 17pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018077067	A1	20180503	WO 2017-CN106516	20171017
CN 106334875	A	20170118	CN 2016-10953787	20161027
MX 2019004121	A	20190606	MX 2019-4121	20171017
KR 2019069471	A	20190619	KR 2019-7013481	20171017
KR 2292675	B1	20210823		
EP 3533558	A1	20190904	EP 2017-864438	20171017
JP 2019535894	T	20191212	JP 2019-520992	20171017
JP 6829312	B2	20210210		
US 20200038998	A1	20200206	US 2019-16339215	20190403
US 11014195	B2	20210525		
IN 201917015151	A	20190719	IN 2019-17015151	20190415

PRIORITY APPLN. INFO.: CN 2016-10953787 A 20161027
WO 2017-CN106516 W 20171017

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2018077067	A1	Dead	20210617
CN 106334875	A	Dead	20201121
MX 2019004121	A	Alive	20201120
KR 2019069471	A	Alive	20201203
KR 2292675	B1	Alive	20210909
EP 3533558	A1	Alive	20201203
JP 6829312	B2	Alive	20210218
US 20200038998	A1	Alive	20201121
US 11014195	B2	Alive	20210604

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The invention discloses a steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof. The steel welding part with aluminum or aluminum alloy plating layer comprises a steel substrate and a plating layer, the plating layer comprises an intermetallic compd. alloy layer in contact with the substrate, and a metal alloy layer thereon; which is characterized in that on at least one of the plated surfaces of the weld blank, the plating layer located in the area to be welded of the weld blank is completely removed, and the end face of the welding blank part plating layer removed the region to be welded is perpendicular to the surface of the substrate which is parallel to weld seam to form an included angle β, and the included angle β =0-80°. A method of manufg. steel welding part with aluminum or aluminum alloy plating layer is characterized in that it includes the steps of: obtaining weld blank by welding according to the requirements of steel welding part with aluminum or aluminum alloy plating layer, welding the area to be welded of the weld blank where the

plating layer has been completely removed to form a welded joint; obtaining a part by hot stamping, selecting a cooling rate which is greater than the crit. transformation speed of the matrix martensite quenching, and cooling. This invention ensures tensile strength, elongation rate and corrosion resistance of welding joint after hot stamping.

IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-32 [I]; C22C0038-04 [I]
IPCR B23K0026-32 [I]; C22C0038-04 [I]
CC 56-9 (Nonferrous Metals and Alloys)
Section cross-reference(s): 47
ST steel laser welding corrosion strength
IT Corrosion resistance
Elongation, mechanical
Laser welding
Plating process
Tensile strength
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT Intermetallic compounds
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 1273096-81-3, Aluminum alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

L13 ANSWER 12 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2017:342418 CAPLUS Full-text
DOCUMENT NUMBER: 166:297159
TITLE: Method for manufacturing steel plate with aluminum or aluminum alloy coating by hot stamping
INVENTOR(S): Liu, Xin; Hong, Zhenjun; Tan, Ning; Jin, Xinyan; Liu, Junxiang; Hong, Jiyao
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 15pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese

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FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     CN 106466697         A    20170301    CN 2016-10664566         20160812
     CN 106466697         B    20200131
PRIORITY APPLN. INFO.:                     CN 2016-10664566         20160812
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  -------------   -----------
     CN 106466697         A    Alive           20201121
     CN 106466697         B    Alive           20201121
AB   The invention discloses a manuf. method of steel plate, which comprises
     the following steps: blanking the steel plate with aluminum or aluminum
     alloy coating by blanking or laser cutting, induction heating, hot
     stamping in die, and cooling.  The temp. and time of heating are detd. by
     the thickness of steel plate.  The components of the steel plate is as
     follows: C 0.08-0.8%, Si 0.05-1.0%, Mn 0.1-5%, P<0.3%, S<0.1%, Al<0.3%,
     Ti<0.5%, B 0.0005-0.1%, Cr 0.01-3%, and balance of Fe and inevitable
     impurities.  The coating comprises alloy layer, aluminum enriched
     intermetallic compd. layer, intermediate layer and surface layer.  The
     components of the alloy layer is Si 0-6%, Fe 75-96%, Al 2-12%; the
     components of the aluminum enriched intermetallic compd. layer is Si 0-2%,
     Fe 30-50%, Al 40-60%; the components of the intermediate layer is Si 2-6%,
     Fe 50-65%, Al 20-35%; and the components of the surface layer is Si 2-6%,
     Fe 50-65%, Al 20-35%.  The product has high strength, complex shape, good
     formability, high precision, and small springback, which can be used for
     automobile parts such as bumper, pillar reinforced plate, floor inside
     passage, and stiffening beam, etc..
IT   2067242-22-0P, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8,
     chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur
     0-0.1, titanium 0-0.5, iron bal.
     RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical
     process); TEM (Technical or engineered material use); PREP (Preparation);
     PROC (Process); USES (Uses)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)
RN   2067242-22-0  CAPLUS
CN   Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al
     0-0.3,P 0-0.3,B 0-0.1,S 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      89   - 100       7439-89-6
    Mn       0.1 -   5       7439-96-5
    Cr       0   -   3       7440-47-3
    Si       0   -   1       7440-21-3
    C        0.1 -   0.8     7440-44-0
    Ti       0   -   0.5     7440-32-6
    Al       0   -   0.3     7429-90-5
    P        0   -   0.3     7723-14-0
    B        0   -   0.1     7440-42-8
    S        0   -   0.1     7704-34-9

IPCI B21D0053-88; C22C0038-02; C22C0038-04; C22C0038-06; C22C0038-32;
     C22C0038-60; C23C0002-12; C23C0002-40
IPCR B21D0053-88 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I];
     C22C0038-32 [I]; C22C0038-60 [I]; C23C0002-12 [I]; C23C0002-40 [I]
CC   55-1 (Ferrous Metals and Alloys)
ST   hot stamping aluminum alloy steel plate coating manuf
IT   Coating materials
     Cooling
     Induction heating
     Industrial manufacturing
     Laser cutting
     Quenching (cooling)
     Transmissions (mechanical)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)
IT   Metalworking
        (stamping, hot; method for manufg. steel plate with aluminum
```

or aluminum alloy coating by hot stamping)

IT 2067242-22-0P, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal. 2087430-40-6P, Aluminum 2-12, iron 75-96, silicon 0-6 2087430-41-7P, Aluminum 40-60, iron 30-50, silicon 0-2 2087430-42-8P, Aluminum 20-35, iron 50-65, silicon 2-6
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(method for manufg. steel plate with aluminum or aluminum alloy coating by hot stamping)

IT 2087430-39-3, Iron 0-4, silicon 5-11, Aluminum bal.
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(method for manufg. steel plate with aluminum or aluminum alloy coating by hot stamping)

IT 7429-90-5, Aluminum, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. steel plate with aluminum or aluminum alloy coating by hot stamping)

L13 ANSWER 13 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2017:100416 CAPLUS Full-text
DOCUMENT NUMBER: 166:179501
TITLE: Steel welding part with aluminum or aluminum alloy plating layer and manufacture method thereof
INVENTOR(S): Pan, Hua; Su, Yongchao; Lei, Ming; Shi, Lei; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 8pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 106334875	A	20170118	CN 2016-10953787	20161027
WO 2018077067	A1	20180503	WO 2017-CN106516	20171017
MX 2019004121	A	20190606	MX 2019-4121	20171017
KR 2019069471	A	20190619	KR 2019-7013481	20171017
KR 2292675	B1	20210823		
EP 3533558	A1	20190904	EP 2017-864438	20171017
JP 2019535894	T	20191212	JP 2019-520992	20171017
JP 6829312	B2	20210210		
US 20200038998	A1	20200206	US 2019-16339215	20190403
US 11014195	B2	20210525		
IN 201917015151	A	20190719	IN 2019-17015151	20190415

PRIORITY APPLN. INFO.:
CN 2016-10953787 A 20161027
WO 2017-CN106516 W 20171017

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 106334875	A	Dead	20201121
WO 2018077067	A1	Dead	20210617
MX 2019004121	A	Alive	20201120
KR 2019069471	A	Alive	20201203
KR 2292675	B1	Alive	20210909
EP 3533558	A1	Alive	20201203
JP 6829312	B2	Alive	20210218
US 20200038998	A1	Alive	20201121
US 11014195	B2	Alive	20210604

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention discloses a steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof. The steel welding part with aluminum or aluminum alloy plating layer comprises a steel substrate and a plating layer, the plating layer comprises an intermetallic compd. alloy layer in contact with the substrate, and a metal alloy layer thereon; which is characterized in that on at least one of the plated surfaces of the weld blank, the plating layer located in the area to be welded of the weld blank is completely removed, and the end

face of the welding blank part plating layer removed the region to be welded is perpendicular to the surface of the substrate which is parallel to weld seam to form an included angle β, and the included angle β =0-80°. A method of manufg. steel welding part with aluminum or aluminum alloy plating layer is characterized in that it includes the steps of: obtaining weld blank by welding according to the requirements of steel welding part with aluminum or aluminum alloy plating layer, welding the area to be welded of the weld blank where the plating layer has been completely removed to form a welded joint; obtaining a part by hot stamping, selecting a cooling rate which is greater than the crit. transformation speed of the matrix martensite quenching, and cooling. This invention ensures tensile strength, elongation rate and corrosion resistance of welding joint after hot stamping.

IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-32; C22C0038-04; C22C0038-02; C22C0038-06; C22C0038-14; C22C0038-18; C23C0002-12; B23K0103-20

IPCR B23K0026-32 [I]; B23K0103-20 [N]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-14 [I]; C22C0038-18 [I]; C23C0002-12 [I]

CC 56-9 (Nonferrous Metals and Alloys)
Section cross-reference(s): 47

ST steel welding part aluminum alloy plating layer

IT Metalworking
(stamping, hot; steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

IT Corrosion-resistant materials
Industrial manufacturing
Joints, mechanical
Laser ablation
Laser welding
Plating process
Welding apparatus
Welds
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

IT 12003-42-8 12004-62-5 12043-58-2
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

IT 1273096-81-3P, Aluminum alloy
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.

RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L13 ANSWER 14 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:1576042 CAPLUS Full-text
DOCUMENT NUMBER: 157:669359
TITLE: Bainitic steel pipe with high hardness, toughness, and plasticity and its manufacturing method
INVENTOR(S): Liu, Wenli; Tan, Zhunli; Shi, Qingzhi; Gao, Guhui
PATENT ASSIGNEE(S): Panzhihua Bainite Wear-Resistant Pipe Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 7pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 102747272	A	20121024	CN 2012-10270792	20120801
CN 102747272	B	20140827		

PRIORITY APPLN. INFO.: CN 2012-10270792 20120801
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 102747272	A	Dead	20201120
CN 102747272	B	Dead	20201120

AB The bainitic pipe steel contains C 0.1-0.5, Mn 1.2-5, Cr 0-1.8, Si 0.1-3, Al 0.001-2, S 0.001-0.1, and P 0.001-0.1. The steel may also contain Ni 0.1-1, V 0.01-1 Ti 0.01-1, Nb 0.001-0.1, N 0.001-0.1, B 0.001-0.1, Re 0.001-1, Ca 0.001-0.1, Mo 0.1-1, and/or Cu 0.01-0.5 wt.%. The steel has the following mech. properties: hardness HRC 20-70; V-notched impact toughness >30 J/cm2; tensile strength 500-2500 MPa; yield strength 400-2000 MPa. The method manufg. the bainitic steel pipe comprises: (1) smelting the steel in steelmaking converter, refining, rolling to produce bainitic steel pipe (contg. >10% residual austenite); (2) smelting, hot rolling, controlled cooling the pipe to 300-500°, natural cooling, heating to 300-500°, naturally cooling. The invention provides the steel plasticity improved above 50%; the manufg. process is simple, has low cost, and provides high quality steel suitable for high-performance and high-wear resistant pipes.
IT 1404308-53-7P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(bainitic steel pipe with high hardness, toughness, and plasticity and its manufg. method)
RN 1404308-53-7 CAPLUS
CN Iron alloy, base, Fe 82-99,Mn 1.2-5,Si 0.1-3,Al 0-2,Cr 0-1.8,Mo 0-1,Ni 0-1,Re 0-1,Ti 0-1,V 0-1,C 0.1-0.5,Cu 0-0.5,B 0-0.1,Ca 0-0.1,N 0-0.1,Nb 0-0.1,P 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	82 - 99	7439-89-6
Mn	1.2 - 5	7439-96-5
Si	0.1 - 3	7440-21-3
Al	0 - 2	7429-90-5
Cr	0 - 1.8	7440-47-3
Mo	0 - 1	7439-98-7
Ni	0 - 1	7440-02-0
Re	0 - 1	7440-15-5
Ti	0 - 1	7440-32-6
V	0 - 1	7440-62-2
C	0.1 - 0.5	7440-44-0
Cu	0 - 0.5	7440-50-8
B	0 - 0.1	7440-42-8

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    Ca      0   -   0.1      7440-70-2
    N       0   -   0.1     17778-88-0
    Nb      0   -   0.1      7440-03-1
    P       0   -   0.1      7723-14-0
    S       0   -   0.1      7704-34-9

IPCI C22C0038-04 [I]; C22C0038-38 [I]; C22C0038-34 [I]; C22C0038-58 [I];
     C21D0008-10 [I]; C22C0038-04; C22C0038-38; C22C0038-34; C22C0038-58;
     C21D0008-10
IPCR C22C0038-04 [I]; C21D0008-10 [I]; C22C0038-34 [I]; C22C0038-38 [I];
     C22C0038-58 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   bainite steel pipe smelting rolling mech property
IT   Mechanical properties
     Pipes and Tubes
     Rolling (metals)
        (bainitic steel pipe with high hardness, toughness, and
        plasticity and its manufg. method)
IT   Smelting
        (iron bath; bainitic steel pipe with high hardness,
        toughness, and plasticity and its manufg. method)
IT   12244-31-4, Austenite, formation (nonpreparative)   12427-23-5, Bainite
     RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
        (bainitic steel pipe with high hardness, toughness, and
        plasticity and its manufg. method)
IT   1404308-53-7P
     RL: IMP (Industrial manufacture); PRP (Properties); TEM (Technical or
     engineered material use); PREP (Preparation); USES (Uses)
        (bainitic steel pipe with high hardness, toughness, and
        plasticity and its manufg. method)


L13  ANSWER 15 OF 18  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2012:665719  CAPLUS Full-text
DOCUMENT NUMBER:         156:594034
TITLE:                   Method for manufacturing automobile part having
                         different local strengths using heat-treatment
                         hardening steel plate
INVENTOR(S):             Nam, Seung-Man; Chae, Su-Hong; Kwon, Min-Suck; Kim,
                         Hyo-Sub; Im, Hee-Joong; Lee, Bo-Ryong; Moon, Man-Been
PATENT ASSIGNEE(S):      Hyundai Hysco, S. Korea
SOURCE:                  PCT Int. Appl., 19pp.
                         CODEN: PIXXD2
DOCUMENT TYPE:           Patent
LANGUAGE:                Korean
FAMILY ACC. NUM. COUNT:  2
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    ---------------------    --------
     WO 2012060496        A1   20120510    WO 2010-KR7829           20101108
     KR 1033767           B1   20110509    KR 2010-108528           20101103
     CN 102712962         A    20121003    CN 2010-80038066         20101108
     CN 102712962         B    20170524
     JP 2013501631        T    20130117    JP 2012-541934           20101108
     JP 5509337           B2   20140604
     EP 2636759           A1   20130911    EP 2010-855727           20101108
     EP 2636759           B1   20190605
     US 20120216920       A1   20120830    US 2012-13390537         20120215
     US 20150167111       A1   20150618    US 2015-14630390         20150224
PRIORITY APPLN. INFO.:                      KR 2010-108528       A   20101103
                                            WO 2010-KR7829       W   20101108
                                            US 2012-13390537     A3  20120215
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     --------------      ----  -------------   -----------
     WO 2012060496        A1   Dead            20201202
     KR 1033767           B1   Alive           20201121
     CN 102712962         A    Alive           20201121
     CN 102712962         B    Alive           20201120
     JP 5509337           B2   Alive           20201121
     EP 2636759           A1   Indeterminate   20201106
     EP 2636759           B1   Indeterminate   20201106
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     US 20120216920       A1   Dead            20201120
     US 20150167111       A1   Dead            20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The present invention relates to a method for manufg. automobile parts
     having different local strengths, and more specifically, to a method for
     manufg. automobile parts using a heat-treatment hardened steel having
     different local thicknesses.  The present invention provides a method for
     manufg. automobile parts comprising: a blank sheet prepn. step for prepg.
     blank sheets using a heat-treatment hardening steel plate having
     different thicknesses, and a heat-treatment hardening steel plate having
     different materials, according to the strength required; a blank conjugate
     forming step for forming a blank conjugate by connecting the blank sheets
     using laser welding; a cold molding step for cold press molding the blank
     conjugates; and a heat-treatment hardening step for heating the
     cold-molded part to above AC3 temp., then resolving mold retention stress
     by quenching the part when constrained in a metal mold, and enhancing the
     strength thereby.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
Aisin Takaoka Ltd      |2004 |     |      |JP 2004058082 A     |CAPLUS
Hyundai Hysco          |2009 |     |      |KR 100902857 B1     |
Sumitomo Metal Ind Ltd |2007 |     |      |JP 2007154257 A     |CAPLUS
Voestalpine Automotive |2006 |     |      |WO 2006015849 A2    |CAPLUS
IT   1374118-68-9
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (method for manufg. automobile part having different local strengths
        using heat-treatment hardening steel plate)
RN   1374118-68-9  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.2-0.5,Ti
     0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1,S 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     94   -  99        7439-89-6
    Mn      0.5 -   3        7439-96-5
    Cr      0   -   1        7440-47-3
    C       0.2 -   0.5      7440-44-0
    Si      0.2 -   0.5      7440-21-3
    Ti      0   -   0.2      7440-32-6
    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    P       0   -   0.1      7723-14-0
    S       0   -   0.1      7704-34-9

IPCI C21D0008-02 [I]; C21D0001-00 [I]; B21D0022-00 [I]; B23K0026-20 [I]
IPCR C21D0008-02 [I]; B21D0022-00 [I]; B23K0026-20 [I]; C21D0001-00 [I]
CC   55-5 (Ferrous Metals and Alloys)
ST   steel heat treatment welding molding hardening zinc coating automobile
IT   Automobile parts
     Coating materials
     Cold-press molding
     Hardening (mechanical)
     Heat treatment
     Laser welding
     Quenching (cooling)
     Residual stress
        (method for manufg. automobile part having different local strengths
        using heat-treatment hardening steel plate)
IT   7429-90-5, Aluminum, processes   7440-66-6, Zinc, processes   11133-86-1
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (coating; method for manufg. automobile part having different local
        strengths using heat-treatment hardening steel plate)
IT   7439-98-7, Molybdenum, uses   7440-02-0, Nickel, uses   7440-03-1,
     Niobium, uses   7440-36-0, Antimony, uses   7440-48-4, Cobalt, uses
     7440-50-8, Copper, uses
     RL: MOA (Modifier or additive use); USES (Uses)
        (method for manufg. automobile part having different local strengths
```

using heat-treatment hardening steel plate)
IT 1297459-46-1, processes 1297459-50-7, processes 1374118-68-9
1374118-70-3, processes 1374118-73-6
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)

L13 ANSWER 16 OF 18 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2005:474761 CAPLUS Full-text
DOCUMENT NUMBER: 143:11135
TITLE: Thermomechanical processing in hot rolling of compact strip from high-strength low-alloy steel ingot cast as a thin slab
INVENTOR(S): Tokarz, Christopher A.; Deardo, Anthony J.; Garcia, C. Isaac; Graham, Clinton
PATENT ASSIGNEE(S): USA
SOURCE: U.S. Pat. Appl. Publ., 15 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
US 20050115649	A1	20050602	US 2004-708807		20040326
PRIORITY APPLN. INFO.:			US 2003-60458153	P	20030327

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
US 20050115649	A1	Dead	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The high-strength low-alloy steel cast as a thin ingot slab is hot rolled with passes above the recrystn. temp. of austenite, and then below the recrystn. temp. The hot-rolling strain and temp. in the initial deformation allows full recrystn., but in the finishing stage there is no recrystn. The process promotes fine and uniform austenite grain size. The result is beneficial for high-strength strip of low-alloy steel in permitting accurate ultrasonic testing of welds. The process is suitable for low-alloy steels contg. C 0.01-0.20, Mn 0.5-3.0, Si 0-2.0, Al 0-2.0, Cr 0-2.0, Mo 0-1.0, Cu 0-3.0, Ni 0-1.5, P 0-0.5, S 0-0.1, N 0.005-0.03, B 0-0.1, and optionally Nb 0-0.2, Ti 0-0.12, and/or V 0-0.15% by wt. The cast ingot slab is nominally 25-100 mm thick.
IT 852534-31-7
RL: TEM (Technical or engineered material use); USES (Uses)
(ingot slab, hot rolling of; thermomech. hot rolling of high-strength strip from low-alloy steel as thin ingot)
RN 852534-31-7 CAPLUS
CN Iron alloy, base, Fe 84-100,Mn 0.5-3,Cu 0-3,Al 0-2,Cr 0-2,Si 0-2,Ni 0-1.5,Mo 0-1,P 0-0.5,C 0-0.2,Nb 0-0.2,V 0-0.2,B 0-0.1,S 0-0.1,Ti 0-0.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	84 - 100	7439-89-6
Mn	0.5 - 3	7439-96-5
Cu	0 - 3	7440-50-8
Al	0 - 2	7429-90-5
Cr	0 - 2	7440-47-3
Si	0 - 2	7440-21-3
Ni	0 - 1.5	7440-02-0
Mo	0 - 1	7439-98-7
P	0 - 0.5	7723-14-0
C	0 - 0.2	7440-44-0
Nb	0 - 0.2	7440-03-1
V	0 - 0.2	7440-62-2
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9
Ti	0 - 0.1	7440-32-6

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INCL 148648000
IPCI C21D0008-00 [ICM,7]
IPCR B21B0001-26 [I]; B21B0001-46 [N]; C21D0008-00 [I]; C21D0008-02 [I]
NCL  148/648.000
CC   55-11 (Ferrous Metals and Alloys)
ST   steel ingot slab hot rolling recrystn strip manuf
IT   Cast steels
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
        (ingot slab; thermomech. hot rolling of high-strength strip from
        low-alloy steel as thin ingot)
IT   Recrystallization
        (of steel, hot rolling with intermediate; thermomech. hot
        rolling of high-strength strip from low-alloy steel as thin
        ingot)
IT   Metalworking
        (steel, hot rolling; thermomech. hot rolling of high-strength
        strip from low-alloy steel as thin ingot)
IT   852534-31-7
     RL: TEM (Technical or engineered material use); USES (Uses)
        (ingot slab, hot rolling of; thermomech. hot rolling of high-strength
        strip from low-alloy steel as thin ingot)
IT   12597-69-2, Steel, processes
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
        (low-alloy; thermomech. hot rolling of high-strength strip from
        low-alloy steel as thin ingot)


L13  ANSWER 17 OF 18  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2005:279051  CAPLUS Full-text
DOCUMENT NUMBER:          142:301477
TITLE:                    Ductile steel and its production
INVENTOR(S):              Bertrand Merino, Carlos; Mateos Martin, Pablo
PATENT ASSIGNEE(S):       Sidenori & D, S.A., Spain
SOURCE:                   Span., 6 pp.
                          CODEN: SPXXAD
DOCUMENT TYPE:            Patent
LANGUAGE:                 Spanish
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     ES 2208047            A1   20040601    ES 2002-63               20020114
     ES 2208047            B1   20050616
PRIORITY APPLN. INFO.:                     ES 2002-63               20020114
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     ES 2208047            A1   Alive           20201121
     ES 2208047            B1   Alive           20201121
AB   The steel with a martensitic-bainitic microstructure contains C
     0.04-0.50, Mn 0.10-2.00, Si ≤1.00, P ≤1.00, S ≤1.00,
     Cr ≤1.00, Nb ≤1.00, Ti ≤1.00, B ≤1.00, Al
     ≤1.00, Mo ≤0.30, and V ≤0.25%.  Wire are produced by
     continuous cold rolling.  The wires are suitable for manuf. of screws.
IT   847790-31-2
     RL: TEM (Technical or engineered material use); USES (Uses)
        (ductile martensitic-bainitic steel for prodn. of wires)
RN   847790-31-2  CAPLUS
CN   Iron alloy, base, Fe 89-100,Mn 0.1-2,Al 0-1,B 0-1,Cr 0-1,Nb 0-1,P 0-1,S
     0-1,Si 0-1,Ti 0-1,C 0-0.5,Mo 0-0.3,V 0-0.2 (9CI)  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     89   - 100        7439-89-6
    Mn      0.1 -   2        7439-96-5
    Al      0   -   1        7429-90-5
    B       0   -   1        7440-42-8
    Cr      0   -   1        7440-47-3
    Nb      0   -   1        7440-03-1
    P       0   -   1        7723-14-0
    S       0   -   1        7704-34-9
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    Si      0   -   1       7440-21-3
    Ti      0   -   1       7440-32-6
    C       0   -   0.5     7440-44-0
    Mo      0   -   0.3     7439-98-7
    V       0   -   0.2     7440-62-2

IPCI C22C0038-24 [ICM,7]; C22C0038-26 [ICS,7]; C22C0038-34 [ICS,7]; C21D0006-00
     [ICS,7]
IPCR B25B0027-00 [I]; B25B0027-28 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   ductile steel wire prodn
IT   Wires
        (ductile martensitic-bainitic steel for prodn. of)
IT   Screws
        (ductile martensitic-bainitic steel wires for prodn. of)
IT   847790-31-2   847790-32-3, uses   847790-33-4, uses
     847790-34-5, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (ductile martensitic-bainitic steel for prodn. of wires)


L13  ANSWER 18 OF 18  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2003:1013082  CAPLUS Full-text
DOCUMENT NUMBER:         140:45300
TITLE:                   Ti-microalloyed low-carbon steel for continuous
                         casting of ingot slab for hot-rolled strip
INVENTOR(S):             Edelman, Daniel Geoffrey; Wigman, Steven Leonard
PATENT ASSIGNEE(S):      Nucor Corporation, USA
SOURCE:                  U.S., 14 pp.
                         CODEN: USXXAM
DOCUMENT TYPE:           Patent
LANGUAGE:                English
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    --------------------     --------
     US 6669789           B1   20031230    US 2001-945185           20010831
PRIORITY APPLN. INFO.:                     US 2001-945185           20010831
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     --------------      ----  -------------   -----------
     US 6669789           B1   Dead            20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The Ti-microalloyed steel is manufd. by: (a) desulfurizing and deoxidn.
     of the molten steel; (b) microalloying with Ti; (c) continuous casting
     of ingot slab 25-100 mm thick; and (d) hot rolling of strip 1.8-13 mm
     thick followed by quenching, for the ferritic microstructure with
     ≥20% acicular ferrite.  The microalloyed steel contains C
     0.01-0.20, Mn 0.5-3.0, Si 0-2.0, N 0.008-0.03, free Ti 0.01-0.12, S 0-0.5,
     Al 0.005-0.08, Cr 0-1.0, Mo 0-1.0, Cu 0-3.0, Ni 0-1.5, B 0-0.1, and P
     0-0.5%.  The steel strip has nominal tensile yield strength of 345-621
     MPa (50-90 kpsi) and higher, and elongation ≥15%.  The higher yield
     strength is typically promoted by the addn. of V and/or Nb.  The strip
     manuf. from continuously cast ingot slab includes hot rolling and
     thermomech. controlled processing with dynamic recrystn. in controlled
     rolling.  The typical microalloyed steel for the strip having tensile
     strength of 621-689 MPa, yield point 552-621 MPa, and elongation 15-24%
     contains C 0.05, Mn 0.90, Al 0.025, free Ti 0.08, N 0.01, and S 0.006%.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work     | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)          | File
=======================+=====+=====+======+=====================+==========
Abraham                |1979 |     |      |US 4141761 A         |CAPLUS
Anon                   |1997 |     |      |Thermomechanical Pro|
Anon                   |2001 |     |      |http://www.chmm.com.|
Anon                   |     |     |      |http://www.us.chmm.c|
Beguinot               |1999 |     |      |US 5972129 A         |CAPLUS
Bodnar                 |1994 |     |      |US 5326527 A         |CAPLUS
Bodnar                 |1996 |     |      |US 5507886 A         |
Bodnar                 |1996 |     |      |US 5514227 A         |CAPLUS
Bosch                  |1971 |     |      |US 3625780 A         |CAPLUS
Chandra, T             |1998 |1    |      |"THERMEC'97", Intern|
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Deardo	1994			US 5352304 A	CAPLUS
Deardo, A	1982		xi	Thermomechanical Pro	
Goodenow	1970			US 3492173 A	CAPLUS
Hensger	2000			US 6030470 A	
Hensger	2001			US 6231696 B1	
Imao, T	1988		80	Thermomechanical Pro	
Kishida	1990			US 4925500 A	CAPLUS
Koo	2000			US 6066212 A	CAPLUS
Kunishige	1984			US 4472208 A	
Lake	1978			US 4082576 A	CAPLUS
Leroy, V			213	Microalloying '95 Co	
Mancini	1982			US 4328032 A	CAPLUS
Matas	1976			US 3997372 A	CAPLUS
Meroni	1997			US 5592988 A	
Moren	1978			US 4123261 A	CAPLUS
Nabeshima	2000			US 6117389 A	CAPLUS
Noe	1996			US 5554235 A	CAPLUS
Pickering, F	1990		79	Microalloyed Vanadiu	
Saito	1977			US 4043382 A	CAPLUS
Sakai	1989			US 4878960 A	CAPLUS
Takeuchi	1998			US 5853043 A	
Tarmann	1972			US 3680623 A	
Teracher	1998			US 5759297 A	CAPLUS
Wright	1989			US 4824492 A	CAPLUS
Yamamoto	1995			US 5421920 A	CAPLUS
Yoshimura	1997			US 5630467 A	

IT 636573-63-2
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; Ti-microalloyed low-C steel for continuous casting of ingot slab for hot-rolled strip)
RN 636573-63-2 CAPLUS
CN Iron alloy, base, Fe 87-100,Mn 0.5-3,Cu 0-3,Si 0-2,Ni 0-1.5,Cr 0-1,Mo 0-1,P 0-0.5,S 0-0.5,C 0-0.2,Al 0-0.1,B 0-0.1,Ti 0-0.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	87 - 100	7439-89-6
Mn	0.5 - 3	7439-96-5
Cu	0 - 3	7440-50-8
Si	0 - 2	7440-21-3
Ni	0 - 1.5	7440-02-0
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
P	0 - 0.5	7723-14-0
S	0 - 0.5	7704-34-9
C	0 - 0.2	7440-44-0
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Ti	0 - 0.1	7440-32-6

INCL 148320000; 420126000; 420128000; 148541000; 148546000; 148547000
IPCI C22C0038-14 [ICM,7]; C22C0038-06 [ICS,7]; C21D0008-02 [ICS,7]
IPCR C21C0007-00 [I]; C21C0007-06 [I]; C21C0007-064 [I]; C21D0001-19 [N]; C21D0008-02 [I]; C22C0038-04 [I]; C22C0038-14 [I]
NCL 148/320.000; 148/541.000; 148/546.000; 148/547.000; 420/126.000; 420/128.000
CC 55-3 (Ferrous Metals and Alloys)
ST titanium microalloyed steel continuous casting ferritic strip manuf
IT Casting of metals
(continuous, of steel; Ti-microalloyed low-C steel for continuous casting of ingot slab for hot-rolled strip)
IT Rolling (metals)
(hot, of steel; Ti-microalloyed low-C steel for continuous casting of ingot slab for hot-rolled strip)
IT 12753-98-9, uses 75044-03-0, uses 78799-42-5, uses 134489-38-6, uses 188620-62-4, uses 636573-63-2
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; Ti-microalloyed low-C steel for continuous casting of ingot slab for hot-rolled strip)
IT 7440-32-6, Titanium, uses

RL: MOA (Modifier or additive use); USES (Uses)
(steel microalloyed with; Ti-microalloyed low-C steel
for continuous casting of ingot slab for hot-rolled strip)
OS.CITING REF COUNT: 5 THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD
(5 CITINGS)

=> display ibib abs retable hitstr hitind l15 1-168

L15 ANSWER 1 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2021:1497300 CAPLUS Full-text
DOCUMENT NUMBER: 175:580329
TITLE: Ultrasonic nanocrystal surface modification for strength improvement and suppression of hydrogen permeation in multi-layered steel
AUTHOR(S): Jo, Min Cheol; Yoo, Jisung; Amanov, Auezhan; Song, Taejin; Kim, Sang-Heon; Sohn, Seok Su; Lee, Sunghak
CORPORATE SOURCE: Center for Advanced Aerospace Materials, Pohang University of Science and Technology, Pohang, 37673, S. Korea
SOURCE: Journal of Alloys and Compounds (2021), 885, 160975
CODEN: JALCEU; ISSN: 0925-8388
DIGITAL OBJECT ID: 10.1016/j.jallcom.2021.160975
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Hydrogen embrittlement of multi-layered steel (MLS) is significantly affected by a degree of hydrogen permeation from surface layers to interfaces. Here, the surface microstructure of multi-layered steel was modified for the first time using ultrasonic nanocrystal surface modification (UNSM), and the roles of UNSM-treated surface layers in strength and hydrogen permeation behavior were investigated by examg. microstructural evolutions of the surface layer. Since the UNSM induced the compressive residual stress, grain refinement, and deformation twin formation at the specimen surface, the yield strength greatly improved via synergetic contributions of the grain refinement effect and dislocation strengthening. In addn., the UNSM-affected zone of 150-210μm along depth direction effectively suppressed the hydrogen permeation by supplying compressive residual stresses and hydrogen trapping sites including grain boundaries, dislocations, and twin boundaries.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Amanov, A	2014	72	187	Tribol Int	CAPLUS
Anon				ISO 17081 Method of	
Ashby, M	2013	68	4	Scr Mater	CAPLUS
Babu, S	2005	36	3281	Metall Mater Trans A	
Beachem, C	1972	3	441	Metall Mater Trans B	
Brass, A	1996	44	3823	Acta Mater	CAPLUS
Cao, X	2010	256	6297	Appl Surf Sci	CAPLUS
Dunne, D	2012	706	1568	Mater Sci Forum	
Dwivedi, S	2018	43	21603	Int J Hydrog Energy	CAPLUS
Gutierrez-Urrutia, I	2011	59	6449	Acta Mater	CAPLUS
Inoue, J	2008	59	1055	Scr Mater	CAPLUS
Jo, M	2021	800		Mater Sci Eng A	CAPLUS
Jo, M	2019	50	4085	Metall Mater Trans A	CAPLUS
Jung, I	2015	55	870	ISIJ Int	CAPLUS
Kamikawa, N	2015	83	383	Acta Mater	CAPLUS
Kim, J	2018	147	304	Acta Mater	CAPLUS
Kim, J	2019	25	912	Met Mater Int	CAPLUS
Kim, J	2017	48	2692	Metall Mater Trans A	CAPLUS
Koyama, M	2014	70	174	Acta Mater	CAPLUS
Koyama, M	2014	39	4634	Int J Hydrog Energy	CAPLUS
Koyama, M	2017	42	12706	Int J Hydrog Energy	CAPLUS
Kubin, L	2003	48	119	Scr Mater	CAPLUS
Lufrano, L	1998	46	1519	Acta Mater	
Mine, Y	2011	528	8100	Mater Sci Eng A	CAPLUS
Mohtadi-Bonab, M	2016	41	4185	Int J Hydrog Energy	CAPLUS

Park, C	2019	25	584	Met Mater Int	CAPLUS
Park, J	2017	686	160	Mater Sci Eng A	CAPLUS
Park, J	2019	759	320	Mater Sci Eng A	CAPLUS
Seok, M	2016	121	164	Acta Mater	CAPLUS
Shin, S	2019	756	508	Mater Sci Eng A	CAPLUS
So, K	2009	49	1952	ISIJ Int	CAPLUS
Sofronis, P	1989	37	317	J Mech Phys Solids	
Takai, K	2003	43	520	ISIJ Int	CAPLUS
Takakuwa, O	2012	37	5268	Int J Hydrog Energy	CAPLUS
Takakuwa, O	2012	206	2892	Surf Coat Technol	CAPLUS
Takayama, K	2011	36	1037	Int J Hydrog Energy	CAPLUS
Wang, S	2018	766	517	J Alloy Compd	CAPLUS
Wu, B	2012	213	271	Surf Coat Technol	CAPLUS
Yao, J	1991	39	119	Acta Metall Mater	CAPLUS
Yazdipour, N	2012	56	49	Comput Mater Sci	CAPLUS
Ye, C	2014	613	274	Mater Sci Eng A	CAPLUS
Yokobori, A	2002	44	407	Corros Sci	CAPLUS
Yu, W	2018	727	70	Mater Sci Eng A	CAPLUS
Zhang, B	2019	740-7	92	Mater Sci Eng A	CAPLUS

IT 2522569-69-1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ultrasonic nanocrystal surface modification for strength improvement and suppression of hydrogen permeation in multi-layered steel
)
RN 2522569-69-1 CAPLUS
CN Steel, Fe 98,Mn 1.3,C 0.4,Cr 0.2,Si 0.2,Mo 0.1,B 0-0.1,Ti 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	98	7439-89-6
Mn	1.3	7439-96-5
C	0.4	7440-44-0
Cr	0.2	7440-47-3
Si	0.2	7440-21-3
Mo	0.1	7439-98-7
B	0 - 0.1	7440-42-8
Ti	0 - 0.1	7440-32-6

CC 55-12 (Ferrous Metals and Alloys)
ST ultrasonic nanocrystal surface modification strength improvement s steel
IT Compression
Crystal dislocations
Deformation (mechanical)
Grain boundaries
Grain refinement
Hydrogen embrittlement
Interface
Microstructure
Residual stress
Sound and Ultrasound
Strength
Surface treatment
Twinning (crystals)
Yield strength
(ultrasonic nanocrystal surface modification for strength improvement and suppression of hydrogen permeation in multi-layered steel
)
IT 1333-74-0, Hydrogen, miscellaneous
RL: MSC (Miscellaneous)
(ultrasonic nanocrystal surface modification for strength improvement and suppression of hydrogen permeation in multi-layered steel
)
IT 2522569-69-1, processes 2522569-74-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ultrasonic nanocrystal surface modification for strength improvement and suppression of hydrogen permeation in multi-layered steel
)

L15 ANSWER 2 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2021:1204659 CAPLUS Full-text
DOCUMENT NUMBER: 175:102969
TITLE: Coated thermoformed component having excellent properties and manufacture method thereof
INVENTOR(S): Tan, Ning; Liu, Junxiang; Huang, Caigen; Jiang, Lei; Wang, Chao
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: PCT Int. Appl., 21pp.; Chemical Indexing Equivalent to 175:125385 (CN)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2021104462	A1	20210603	WO 2020-CN132307	20201127
CN 112877590	A	20210601	CN 2019-11201470	20191129

PRIORITY APPLN. INFO.: CN 2019-11201470 A 20191129
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2021104462	A1	Alive	20210610
CN 112877590	A	Alive	20210610

AB The thermoformed component comprises a substrate and a coating thereon. The substrate comprises the following ingredients in percentage by wt.: 0.01-0.8% of C, 0.05-1.0% of Si, 0.1-5% of Mn, 0.001-0.3% of P, 0.001-0.1% of S, 0.001-0.3% of Al, 0.001-0.5% of Ti, 0.0005-0.1% of B, 0.001-0.5% of Nb, 0.001-0.5% of V, and the remainder being Fe and other unavoidable impurities. The appearance of the thermoformed component has no color difference and no mottling. The surface oxygen content of the thermoformed component is 0.1-20wt.%, and the ratio of the std. deviation to the av. value of the surface oxygen content satisfies: 0 < std. deviation of oxygen content / av. value of oxygen content ≤ 0.3. In the manufg. method, a coated steel plate that has undergone heat treatment, transfer processing, and hot stamping is not treated with oil.
IT 2648457-02-5
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; coated thermoformed component having excellent properties and manuf. method thereof)
RN 2648457-02-5 CAPLUS
CN Iron alloy, base, Fe 90-100,Mn 0.1-5,Si 0-1,Cr 0.2-0.8,C 0-0.8,Nb 0-0.5,Ti 0-0.5,V 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	90 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Si	0 - 1	7440-21-3
Cr	0.2 - 0.8	7440-47-3
C	0 - 0.8	7440-44-0
Nb	0 - 0.5	7440-03-1
Ti	0 - 0.5	7440-32-6
V	0 - 0.5	7440-62-2
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI C23C0002-12 [I]; C23C0002-40 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C21D0001-26 [I]; C21D0008-00 [I]; B21D0022-02 [I]
IPCR C23C0002-12 [I]; B21D0022-02 [I]; C21D0001-26 [I]; C21D0008-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C23C0002-40 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 73
ST coated thermoformed component property manuf
IT Automobile parts

Coating materials
Coating process
Hot-press molding
Laser cutting
(coated thermoformed component having excellent properties and manuf. method thereof)

IT 11133-86-1
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; coated thermoformed component having excellent properties and manuf. method thereof)

IT 2648457-02-5
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; coated thermoformed component having excellent properties and manuf. method thereof)

L15 ANSWER 3 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2021:1026824 CAPLUS Full-text
DOCUMENT NUMBER: 174:863077
TITLE: A coated steel substrate
INVENTOR(S): Vu, Thi Tan; Megido Fernandez, Laura; Dominguez Fernandez, Carlota; Rodriguez Garcia, Jorge; Noriega Perez, David; Suarez Sanchez, Roberto; Blanco Roldan, Cristina
PATENT ASSIGNEE(S): ArcelorMittal, Luxembourg
SOURCE: PCT Int. Appl., 14pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2021084299	A1	20210506	WO 2019-IB59255	20191029
WO 2021084458	A1	20210506	WO 2020-IB60138	20201029
PRIORITY APPLN. INFO.:			WO 2019-IB59255 A	20191029

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2021084299	A1	Alive	20210514
WO 2021084458	A1	Alive	20210514

AB The present invention relates to a coated stainless-steel substrate comprising a coating comprising nanographites and a binder being sodium silicate, wherein the stainless-steel substrate has the following compns. in wt. percent: C ≤ 1.2%, Cr ≥ 11.0%, Ni ≥ 8.0% and on a purely optional basis, one or more elements such as Nb ≤ 6.0%, B ≤ 1.0%, Ti ≤ 3.0%, Cu ≤ 5.0%, Co ≤ 3.0%, N ≤ 1.0%, V ≤ 3.0%, Si ≤ 4.0%, Mn ≤ 5.0%, P ≤ 0.5%, S ≤ 0.5%, Mo ≤ 6.0%, Ce ≤ 1.0%, the remainder of the compn. being made of iron and inevitable impurities resulting from the elaboration; and a method for the manuf. of this coated stainless-steel substrate.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
LALIENA IRANZO - CARLOS	2019			WO 2019122957 A1	CAPLUS
LALIENA IRANZO CARLOS	2019			WO 2019122958 A1	CAPLUS
STARVOS ANTHONY JOHN	1995			EP 0684323 A1	CAPLUS

IT 2640151-46-6
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coated steel substrate)

RN 2640151-46-6 CAPLUS
CN Iron alloy, base, Fe 41-100,Cr 0-11,Ni 0-8,Mo 0-6,Nb 0-6,Cu 0-5,Mn 0-5,Si 0-4,Co 0-3,Ti 0-3,V 0-3,C 0-1.2,B 0-1,Ce 0-1,N 0-1,P 0-0.5,S 0-0.5 (CA INDEX NAME)

Component	Component Percent	Component Registry Number

Fe	41 - 100		7439-89-6
Cr	0 - 11		7440-47-3
Ni	0 - 8		7440-02-0
Mo	0 - 6		7439-98-7
Nb	0 - 6		7440-03-1
Cu	0 - 5		7440-50-8
Mn	0 - 5		7439-96-5
Si	0 - 4		7440-21-3
Co	0 - 3		7440-48-4
Ti	0 - 3		7440-32-6
V	0 - 3		7440-62-2
C	0 - 1.2		7440-44-0
B	0 - 1		7440-42-8
Ce	0 - 1		7440-45-1
N	0 - 1		17778-88-0
P	0 - 0.5		7723-14-0
S	0 - 0.5		7704-34-9

IPCI C23C0024-08 [I]; C23C0002-00 [I]; C23C0002-06 [I]; C04B0014-02 [I]; C04B0028-26 [I]
IPCR C23C0024-08 [I]; C04B0014-02 [I]; C04B0028-26 [I]; C23C0002-00 [I]; C23C0002-06 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST coating stainless steel substrate nanogrpahite
IT Binders
Coating materials
Coating process
Dip coating process
Drying process
Pipelines
Pumps
Rolls
Spin coating process
Spray coating process
(coated steel substrate)
IT 1344-09-8, Sodium silicate
RL: TEM (Technical or engineered material use); USES (Uses)
(binder; coated steel substrate)
IT 7782-42-5, Graphite, miscellaneous
RL: NANO (Nanomaterial)
(coated steel substrate)
IT 2640151-46-6
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coated steel substrate)

L15 ANSWER 4 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2021:1026660 CAPLUS Full-text
DOCUMENT NUMBER: 174:863076
TITLE: A coated steel substrate
INVENTOR(S): Vu, Thi Tan; Megido Fernandez, Laura; Dominguez Fernandez, Carlota; Rodriguez Garcia, Jorge; Noriega Perez, David; Suarez Sanchez, Roberto; Blanco Roldan, Cristina
PATENT ASSIGNEE(S): ArcelorMittal, Luxembourg
SOURCE: PCT Int. Appl., 21pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
WO 2021084458	A1	20210506	WO 2020-IB60138		20201029
WO 2021084299	A1	20210506	WO 2019-IB59255		20191029
PRIORITY APPLN. INFO.:			WO 2019-IB59255	A	20191029

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2021084458	A1	Alive	20210514
WO 2021084299	A1	Alive	20210514

AB The present invention relates to a coated stainless-steel substrate comprising a coating comprising nanographites and a binder being sodium silicate, wherein the stainless-steel substrate has the following compn. in wt. percent: C ≤ 1.2%, Cr ≥ 11.0%, Ni ≥ 8.0% and on a purely optional basis, one or more elements such as Nb ≤ 6.0%, B ≤ 1.0%, Ti ≤ 3.0%, Cu ≤ 5.0%, Co ≤ 3.0%, N ≤ 1.0%, V ≤ 3.0%, Si ≤ 4.0%, Mn ≤ 5.0%, P ≤ 0.5%, S ≤ 0.5%, Mo ≤ 6.0%, Ce ≤ 1.0%, the remainder of the compn. being made of iron and inevitable impurities resulting from the elaboration. The invention also relates to a method for the manuf. of this coated stainless-steel substrate.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
LALIENA IRANZO - CARLOS	2019			WO 2019122957 A1	CAPLUS
LALIENA IRANZO CARLOS	2019			WO 2019122958 A1	CAPLUS
STARVOS ANTHONY JOHN	1995			EP 0684323 A1	CAPLUS

IT 2640151-46-6D, tem pep
RL: TEM (Technical or engineered material use); USES (Uses)
(coated steel substrate)

RN 2640151-46-6 CAPLUS

CN Iron alloy, base, Fe 41-100,Cr 0-11,Ni 0-8,Mo 0-6,Nb 0-6,Cu 0-5,Mn 0-5,Si 0-4,Co 0-3,Ti 0-3,V 0-3,C 0-1.2,B 0-1,Ce 0-1,N 0-1,P 0-0.5,S 0-0.5 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	41 - 100	7439-89-6
Cr	0 - 11	7440-47-3
Ni	0 - 8	7440-02-0
Mo	0 - 6	7439-98-7
Nb	0 - 6	7440-03-1
Cu	0 - 5	7440-50-8
Mn	0 - 5	7439-96-5
Si	0 - 4	7440-21-3
Co	0 - 3	7440-48-4
Ti	0 - 3	7440-32-6
V	0 - 3	7440-62-2
C	0 - 1.2	7440-44-0
B	0 - 1	7440-42-8
Ce	0 - 1	7440-45-1
N	0 - 1	17778-88-0
P	0 - 0.5	7723-14-0
S	0 - 0.5	7704-34-9

IPCI C23C0024-08 [I]; C23C0002-00 [I]; C23C0002-06 [I]; C04B0014-02 [I]; C04B0028-26 [I]
IPCR C23C0024-08 [I]; C04B0014-02 [I]; C04B0028-26 [I]; C23C0002-00 [I]; C23C0002-06 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST steel substrate coating
IT Binders
Coating materials
Coating process
Dip coating process
Drying process
Flanges
Pipelines
Pumps
Rolls
Spin coating process
Spray coating process
(coated steel substrate)
IT Clays
Kaolin
RL: TEM (Technical or engineered material use); USES (Uses)
(coated steel substrate)
IT 7782-42-5, Graphite, miscellaneous
RL: NANO (Nanomaterial)
(coated steel substrate)

IT 1309-48-4, Magnesia, uses 1314-13-2, Zinc oxide, uses 1314-36-9, Yttria, uses 1344-09-8, Sodium silicate 1344-28-1, Alumina, uses 7631-86-9, Silica, uses 13463-67-7, Titania, uses 14808-60-7, Quartz, uses 37220-25-0, Aluminum titanate 2640151-46-6D, tem pep
RL: TEM (Technical or engineered material use); USES (Uses)
(coated steel substrate)

L15 ANSWER 5 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:2713368 CAPLUS Full-text
DOCUMENT NUMBER: 174:278826
TITLE: Steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance
INVENTOR(S): Nakano, Katsuya; Takeda, Kengo; Kawata, Hiroyuki; Uenishi, Akihiro; Suzuki, Yuya
PATENT ASSIGNEE(S): Nippon Steel Corporation, Japan
SOURCE: PCT Int. Appl., 58pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.		DATE
WO 2020262651	A1	20201230	WO 2020-JP25352		20200626
PRIORITY APPLN. INFO.:			JP 2019-121092	A	20190628
			JP 2019-121093	A	20190628

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020262651	A1	Alive	20210122

AB A steel sheet which has a metal structure that contains, in terms of vol. fraction, 95% or more of tempered martensite and a total of 5% or less of one or more structures selected from among ferrite, pearlite, bainite, as-quenched martensite and residual austenite. This steel sheet has a tensile strength of 1,100 MPa or more; the std. deviation of the Vickers hardness is 30 or less as measured under a load of 9.8 N at 30 points in a 300μm square area that is centered at the position of t/2, where t is the sheet thickness, in a cross-section of the steel sheet 10, said cross-section being parallel to the sheet thickness direction; and if nanohardness is measured under a max. load of 1 mN at 100 points in a 100μm square area that is centered at the position of t/2, the ratio of the measurement points that have a nanohardness difference of 3 GPa or more from 8 adjacent measurement points is 10% or less.
IT 2572991-88-7
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
RN 2572991-88-7 CAPLUS
CN Iron alloy, base, Fe 85-99,Mn 0.6-5,Si 0-2.5,Cr 0-2,Al 0-1,Co 0-1,Ni 0-1,Cu 0-0.5,Mo 0-0.5,V 0-0.5,C 0.2-0.4,B 0-0.1,Nb 0-0.1,Ta 0-0.1,Ti 0-0.1,W 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	85 - 99	7439-89-6
Mn	0.6 - 5	7439-96-5
Si	0 - 2.5	7440-21-3
Cr	0 - 2	7440-47-3
Al	0 - 1	7429-90-5
Co	0 - 1	7440-48-4
Ni	0 - 1	7440-02-0
Cu	0 - 0.5	7440-50-8
Mo	0 - 0.5	7439-98-7
V	0 - 0.5	7440-62-2
C	0.2 - 0.4	7440-44-0
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
Ta	0 - 0.1	7440-25-7
Ti	0 - 0.1	7440-32-6

W 0 - 0.1 7440-33-7

IPCI C21D0009-46 [I]; C22C0038-00 [I]; C22C0038-60 [I]
IPCR C21D0009-46 [I]; C22C0038-00 [I]; C22C0038-60 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST carbon silicon titanium steel sheet
IT Galvanizing
(electrogalvanizing, layer; steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
IT Hot-dip galvanizing
(layer; steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
IT Collisions
(resistance; steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
IT Microhardness
Tensile strength
Vickers hardness
(steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
IT 12597-69-2, Steel, properties
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(sheet; steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)
IT 2572991-88-7
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(steel sheet comprising carbon, silicon and titanium with high strength and excellent collision resistance)

L15 ANSWER 6 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:2054532 CAPLUS Full-text
DOCUMENT NUMBER: 173:899795
TITLE: Strong resistance to hydrogen embrittlement via surface shielding in multi-layered austenite/martensite steel sheets
AUTHOR(S): Jo, Min Cheol; Jo, Min Chul; Yoo, Jisung; Song, Taejin; Kim, Sang-Heon; Sohn, Seok Su; Lee, Sunghak
CORPORATE SOURCE: Center for Advanced Aerospace Materials, Pohang University of Science and Technology, Pohang, 37673, S. Korea
SOURCE: Materials Science & Engineering, A: Structural Materials: Properties, Microstructure and Processing (2021), 800, 140319
CODEN: MSAPE3; ISSN: 0921-5093
DIGITAL OBJECT ID: 10.1016/j.msea.2020.140319
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Layered architectures have been applied to twinning-induced plasticity (TWIP) steel in terms of configuring multi-layered TWIP and martensitic steel (MLS) sheets to overcome the limitation of low yield strength. However, hydrogen embrittlement (HE) inevitably appears in materials used for high-strength purposes, with the interfacial layers presenting localization sites of hydrogen, thereby limiting the materials' broad structural applications. Here, we present a novel design for MLS sheets that exhibit both strong resistance to HE and a good strength-ductility balance via surface shielding. Our hydrogen penetration data demonstrates that the proposed austenitic shielding structure effectively acts as a barrier to hydrogen due to the reduced hydrogen diffusivity, compared with existing MLS sheets. We propose the optimal surface thickness required to play the role of shielding layer based on the quantified diffusivity and the rule of mixts. of the layer fractions, which presents a plausible novel design for layered architectures that exhibit strong resistance to HE and possess tunable mech. properties.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File

Anon	1991		261	Electron Probe Quant	
Anon	2004			ISO 17081 Method of	
Ashby, M	2003	51	5801	Acta Mater	CAPLUS
Ashby, M	2013	68	4	Scripta Mater	CAPLUS
Barabash, R	2014	45	98	Metall Mater Trans	CAPLUS
Beachem, C	1972	3	441	Metall Mater Trans B	
Bouaziz, O	2008	10	24	Adv Eng Mater	CAPLUS
Bouaziz, O	2016	18	56	Adv Eng Mater	CAPLUS
Cetin, A	2012	60	2265	Acta Mater	CAPLUS
Chin, K	2018	24	489	Met Mater Int	CAPLUS
Cho, L	2018	734	416	Mater Sci Eng, A	CAPLUS
Cho, L	2018	735	448	Mater Sci Eng, A	CAPLUS
De Cooman, B	2011			New Trends and Devel	
Devanathan, M	1962	270	90	Proc R Soc A	CAPLUS
Dunne, D	2012	706	1568	Mater Sci Forum	
Dwivedi, S	2018	43	21603	Int J Hydrogen Energ	CAPLUS
Enomoto, M	2012	43	572	Metall Mater Trans	CAPLUS
Fang, T	2011	331	1587	Science	CAPLUS
Grassel, O	2000	16	1391	Int J Plast	CAPLUS
Gutierrez-Urrutia, I	2010	527	3552	Mater Sci Eng, A	
Gwon, H	2017	696	416	Mater Sci Eng, A	CAPLUS
Han, D	2015	99	45	Scripta Mater	CAPLUS
He, J	2018	726	288	Mater Sci Eng, A	CAPLUS
Huang, M	2018	153	235	Acta Mater	CAPLUS
Ichimura, M	1991	32	1109	Mater Trans, JIM	CAPLUS
Inoue, J	2008	59	1055	Scripta Mater	CAPLUS
Jin, J	2012	60	1680	Acta Mater	CAPLUS
Jo, M	2019	50	4085	Metall Mater Trans	CAPLUS
Jo, S	2015	627	374	J Alloys Compd	CAPLUS
Kim, J	2018	147	304	Acta Mater	CAPLUS
Kim, J	2009	505	105	Mater Sci Eng, A	
Kim, J	2017	682	164	Mater Sci Eng, A	CAPLUS
Kim, J	2019	25	912	Met Mater Int	CAPLUS
Kim, J	2019	9	6829	Sci Rep	
Koseki, T	2014	55	227	Mater Trans	CAPLUS
Koyama, M	2013	61	4607	Acta Mater	CAPLUS
Koyama, M	2017	355	1055	Science	CAPLUS
Kubin, L	2003	48	119	Scripta Mater	CAPLUS
Kwon, Y	2018	43	10129	Int J Hydrogen Energ	CAPLUS
Lee, J	2019	9	5219	Sci Rep	
Li, Y	2013	61	2588	J Mech Phys Solid	CAPLUS
Mohtadi-Bonab, M	2019	25	1109	Met Mater Int	CAPLUS
Oh, S	2020	188	366	Acta Mater	CAPLUS
Park, C	2019	25	584	Met Mater Int	CAPLUS
Park, I	2015	93	63	Corrosion Sci	CAPLUS
Park, J	2017	686	160	Mater Sci Eng, A	CAPLUS
Park, J	2019	759	320	Mater Sci Eng, A	CAPLUS
Ritchie, R	2011	10	817	Nat Mater	CAPLUS
Seok, M	2016	121	164	Acta Mater	CAPLUS
Song, E	2014	87	9	Scripta Mater	CAPLUS
Takai, K	2003	43	520	ISIJ Int	CAPLUS
Wang, M	2005	398	37	Mater Sci Eng, A	
Wang, Y	2002	419	912	Nature	CAPLUS
Wang, Y	2018	150	22	Scripta Mater	CAPLUS
Wei, Y	2014	5	3580	Nat Commun	
Wu, X	2014	2	185	Mater Res Lett	CAPLUS
Yanagimoto, J	2010	59	287	CIRP Ann - Manuf Tec	
Yokota, T	2003	43	534	ISIJ Int	CAPLUS
Yu, W	2018	727	70	Mater Sci Eng, A	CAPLUS
Zhang, Y	2019	165	15	Scripta Mater	CAPLUS

IT 2522569-69-1, C 0.35, Mn 1.3, Si 0.15, Mo 0.1, Cr 0.2, Ti 0-0.06, B 0-0.06, Fe bal., processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(strong resistance to hydrogen embrittlement via surface shielding in multi-layered austenite/martensite steel sheets)

RN 2522569-69-1 CAPLUS

CN Steel, Fe 98,Mn 1.3,C 0.4,Cr 0.2,Si 0.2,Mo 0.1,B 0-0.1,Ti 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number

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=========+=============+================
    Fe          98             7439-89-6
    Mn           1.3           7439-96-5
    C            0.4           7440-44-0
    Cr           0.2           7440-47-3
    Si           0.2           7440-21-3
    Mo           0.1           7439-98-7
    B        0  -   0.1        7440-42-8
    Ti       0  -   0.1        7440-32-6

CC   55-8 (Ferrous Metals and Alloys)
ST   TWIP steel multilayer austenite martensite shielding hydrogen
     embrittlement resistance
IT   Diffusion
     Elongation, mechanical
     Fracture surface morphology
     Hydrogen embrittlement
     Interface
     Microstructure
     Multilayers
     Sheet materials
     Shields
     Stress-strain relationship
     Tensile strength
     Yield strength
        (strong resistance to hydrogen embrittlement via surface shielding in
        multi-layered austenite/martensite steel sheets)
IT   1333-74-0, Hydrogen, processes
     RL: OCU (Occurrence, unclassified); PEP (Physical, engineering or chemical
     process); OCCU (Occurrence); PROC (Process)
        (strong resistance to hydrogen embrittlement via surface shielding in
        multi-layered austenite/martensite steel sheets)
IT   12173-93-2, Martensite, processes   12244-31-4, Austenite, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (strong resistance to hydrogen embrittlement via surface shielding in
        multi-layered austenite/martensite steel sheets)
IT   2362540-95-0, C 1.2, Mn 13, Si 0.2, Fe bal.   2522569-69-1, C
     0.35, Mn 1.3, Si 0.15, Mo 0.1, Cr 0.2, Ti 0-0.06, B 0-0.06, Fe bal.,
     processes   2522569-74-8, C 0.7, Mn 17, Si 0.6, V 0.3, Al 1.3, Fe bal.
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (strong resistance to hydrogen embrittlement via surface shielding in
        multi-layered austenite/martensite steel sheets)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 7 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2020:1569923  CAPLUS Full-text
DOCUMENT NUMBER:          173:359646
TITLE:                    Al-Fe-based plated steel sheet for hot press, and
                          method for manufacturing hot press member
INVENTOR(S):              Sato, Rinta; Nakajima, Seiji; Ando, Satoru
PATENT ASSIGNEE(S):       JFE Steel Corp., Japan
SOURCE:                   Jpn. Kokai Tokkyo Koho, 15pp.
                          CODEN: JKXXAF
DOCUMENT TYPE:            Patent
LANGUAGE:                 Japanese
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     JP 2020122202         A    20200813    JP 2019-16283            20190131
PRIORITY APPLN. INFO.:                      JP 2019-16283            20190131
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     JP 2020122202         A    Alive           20201121
AB   The title Al-Fe-based plated steel sheet can obtain a hot press member
     having excellent corrosion resistance after coating and excellent
     corrosion resistance at the joint portion while realizing a high temp.
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rising rate when subjected to heating by a furnace heating method performed before hot pressing. The Al-Fe-based plated steel sheet for hot press comprises a base steel sheet, an Al-Fe alloy plated layer formed on at least one surface of the base steel sheet with an adhesion amt. per one surface of 30-100 g/m2, having a compn. including Fe 25-90% by mass, Si 0-1% by mass and Al and unavoidable impurities as balance, and unalloyed Al attached to the surface of the Al-Fe alloy plated layer with an adhesion amt. per one surface of 0-90 mg/m2.

IT 1356847-15-8
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Al-Fe-based plated steel sheet for hot press, and method for manufg. hot press member)

RN 1356847-15-8 CAPLUS

CN Iron alloy, base, Fe 93-99,Mn 0.5-3,Si 0-2,Cr 0-1,C 0.2-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

IPCI C23C0002-12 [I]; C23C0002-28 [I]; C22C0021-00 [I]; C22C0038-00 [I]; C22C0021-02 [I]; C22C0038-60 [I]; C21D0009-00 [I]; C21D0001-18 [I]

IPCR C23C0002-12 [I]; C21D0001-18 [I]; C21D0009-00 [I]; C22C0021-00 [I]; C22C0021-02 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C23C0002-28 [I]

CC 56-11 (Nonferrous Metals and Alloys)

ST aluminum iron plating steel sheet hot press

IT Heating
Hot-press molding
(Al-Fe-based plated steel sheet for hot press, and method for manufg. hot press member)

IT 7429-90-5, Aluminum, processes 1356847-15-8 2460706-65-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Al-Fe-based plated steel sheet for hot press, and method for manufg. hot press member)

L15 ANSWER 8 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2020:1063971 CAPLUS Full-text

DOCUMENT NUMBER: 173:85787

TITLE: Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufacturing method

INVENTOR(S): Bi, Wenzhen; Hong, Jiyao; Wang, Li

PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China

SOURCE: PCT Int. Appl., 23pp.
CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2020108594	A1	20200604	WO 2019-CN121860	20191129
CN 109371325	A	20190222	CN 2018-11454798	20181130

PRIORITY APPLN. INFO.: CN 2018-11454798 A 20181130

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020108594	A1	Alive	20201203
CN 109371325	A	Dead	20210826

AB Provided are a zinc-based plated hot-formed steel plate or steel strip

having excellent cold bending performance, and a manufg. method thereof; said zinc-based plated hot-formed steel plate or steel strip comprises a substrate having a surface decarburized layer thickness of less than 20 um and a zinc-based plated layer having an adhesion amt. of 10 to 100 g/m.cxa. 2; the component wt. percentages of the substrate are: C: 0.1-0.8%, Si: 0.05-2.0%, Mn: 0.5-3.0%, P≤0.1%, S≤0.05%, Al≤0.1%, N≤0.01%; the remainder is Fe and unavoidable impurities; the av. size of original austenite grains of the substrate is less than 15 um. After hot forming of the substrate, the hot-formed steel plate or steel strip has a tensile strength of 1500 MPa and elongation after fracture of 5%, and the coating is continuous and complete, there are no cracks extending to the substrate, and the steel plate has excellent cold bending performance.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
AZUMA MASASHI	2011			JP 2011111675 A	CAPLUS
BI WENZHEN	2017			CN 107127238 A	CAPLUS
BI WENZHEN	2019			CN 109371325 A	CAPLUS
JIN KWANG-KEUN	1996			KR 960005237 B1	
KAWATA HIROYUKI	2014			CN 103874776 A	CAPLUS
TAKEDA GENTARO	2018			WO 2018207560 A1	CAPLUS
TANAKA YUKIMOTO	2012			JP 2012251229 A	CAPLUS
YUANQIANG TU	2010			CN 101880832 A	CAPLUS
ZHOU SHU	2016			CN 106244923 A	CAPLUS
ZHOU SHU	2016			CN 106244923 A	CAPLUS

IT 2293976-55-1D, Aluminum 0-0.1, carbon 0.1-0.8, manganese 0.5-3, phosphorus 0-0.1, silicon 0.05-2, Cr 0-1, Mo 0-1, Ti 0-0.2, Nb 0-0.08, V 0-1, B 0-0.08, iron bal., nitrogen 0-0.01
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)

RN 2293976-55-1 CAPLUS

CN Iron alloy, base, Fe 91-99,Mn 0.5-3,Si 0-2,Cr 0-1,Mo 0-1,V 0-1,C 0.1-0.8,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	91 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0

IPCI C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-60 [I]; C22C0038-06 [I]; C23C0002-40 [I]; C21D0008-02 [I]
IPCR C22C0038-02 [I]; C21D0008-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-60 [I]; C23C0002-40 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST cold bending performance zinc coating steel manuf hot stamping
IT Coating materials
(Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)
IT Galvanized steel
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)
IT Metalworking
(stamping, hot; Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)

IT 2293976-55-1D, Aluminum 0-0.1, carbon 0.1-0.8, manganese 0.5-3, phosphorus 0-0.1, silicon 0.05-2, Cr 0-1, Mo 0-1, Ti 0-0.2, Nb 0-0.08, V 0-1, B 0-0.08, iron bal., nitrogen 0-0.01
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)
IT 7440-66-6, Zinc, processes 98357-26-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Zinc-coated hot-stamped steel plate or strip with excellent cold bending performance and its manufg. method)

L15 ANSWER 9 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:1063958 CAPLUS Full-text
DOCUMENT NUMBER: 173:85818
TITLE: Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance
INVENTOR(S): Bi, Wenzhen; Hong, Jiyao; Wang, Li
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: PCT Int. Appl., 17pp.; Chemical Indexing Equivalent to 170:379972 (CN)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2020108593	A1	20200604	WO 2019-CN121859	20191129
CN 109365606	A	20190222	CN 2018-11453322	20181130
PRIORITY APPLN. INFO.:			CN 2018-11453322 A	20181130

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020108593	A1	Alive	20201203
CN 109365606	A	Transitional	20210722

AB A method for forming a zinc-plated steel plate or steel belt having good corrosion resistance, comprising the following steps: 1) conveying the steel plate or steel belt into a heating furnace higher than Ac3, austenitizing the steel plate or steel belt, and keeping the temp. for 1-7 min; 2) before the steel plate or steel belt leaves the heating furnace and enters a forming mold, applying different cooling manners according to different plated thicknesses, wherein when the single-sided wt. of the plating is less than or equal to 50g/m2, only air cooling is required before transferring to the forming mold, when the single-sided wt. of the plating is greater than 50g/m2, aerial fog or water mist precooling is performed before transferring to the forming mold, and the steel plate is cooled to be below 700°C at a cooling sped greater than 30°C/s; and 3) rapidly transferring the steel plate or steel belt to the mold for hot stamping forming, wherein a transferring duration does not exceed 1 min, and the temp. of the hot stamping forming is controlled between 400-800°C. The tensile strength of the steel plate or steel belt after hot stamping is greater than 1,450 MPa, and substrate cracks caused by local press and LME in an element are avoided.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
AKIRA OBAYASHI	2005			CN 1600877 A	CAPLUS
BI WENZHEN	2017			CN 107127238 A	CAPLUS
BI WENZHEN	2017			CN 107127238 A	CAPLUS
BI WENZHEN	2019			CN 109365606 A	CAPLUS
KOJIMA TAKESHI	2017			CN 106756697 A	CAPLUS
SEKIDO YOSHITO	2013			JP 2013227614 A	CAPLUS
TAKEBAYASHI SHIGETO	2009			JP 2009228134 A	CAPLUS
WILHELM WARNECKE	2010			CN 101849029 A	CAPLUS
YI HONGLIANG	2015			CN 104846274 A	CAPLUS

IT 2293976-55-1

RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)

RN 2293976-55-1 CAPLUS

CN Iron alloy, base, Fe 91-99,Mn 0.5-3,Si 0-2,Cr 0-1,Mo 0-1,V 0-1,C 0.1-0.8,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	91	-	99	7439-89-6
Mn	0.5	-	3	7439-96-5
Si	0	-	2	7440-21-3
Cr	0	-	1	7440-47-3
Mo	0	-	1	7439-98-7
V	0	-	1	7440-62-2
C	0.1	-	0.8	7440-44-0
Ti	0	-	0.2	7440-32-6
Al	0	-	0.1	7429-90-5
B	0	-	0.1	7440-42-8
Nb	0	-	0.1	7440-03-1
P	0	-	0.1	7723-14-0

IPCI B21D0022-02 [I]; C23C0002-06 [I]; C23C0002-40 [I]; C22C0018-00 [I]; C21D0008-02 [I]

IPCR B21D0022-02 [I]; C21D0008-02 [I]; C22C0018-00 [I]; C23C0002-06 [I]; C23C0002-40 [I]

CC 55-6 (Ferrous Metals and Alloys)

ST corrosion resistance zinc alloy coating steel hot stamping

IT Anticorrosive coating materials
Coating materials
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)

IT Metalworking
(stamping, hot; Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)

IT 2293976-55-1
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)

IT 2226545-76-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)

L15 ANSWER 10 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2020:1041904 CAPLUS Full-text

DOCUMENT NUMBER: 173:612711

TITLE: Aluminum or aluminum alloy plated steel differential strength welded part and its manufacture

INVENTOR(S): Pan, Hua; Liu, Chengjie; Lei, Ming; Wu, Yue; Sun, Zhongqu; Jiang, Haomin

PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China

SOURCE: Faming Zhuanli Shenqing, 12pp.
CODEN: CNXXEV

DOCUMENT TYPE: Patent

LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 111215751	A	20200602	CN 2019-10249188	20190329
WO 2020200110	A1	20201008	WO 2020-CN81743	20200327
EP 3815837	A1	20210505	EP 2020-785301	20200327

PRIORITY APPLN. INFO.: CN 2019-10249188 A 20190329
WO 2020-CN81743 W 20200327

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 111215751	A	Alive	20201120
WO 2020200110	A1	Alive	20201203
EP 3815837	A1	Alive	20210506

AB The invention discloses a steel differential strength welding part with an aluminum or aluminum alloy coating and a manufg. method thereof, wherein the steel differential strength welding part is formed by butt welding a high-strength steel plate and a low-strength steel plate, and the high-strength steel plate and the low-strength steel plate comprise a substrate and at least one of the surfaces of the substrate and the substrate is a pure aluminum or aluminum alloy coating; the high-strength steel plate matrix comprises the following components in percentage by wt.: c 0.08-0.8%, Si 0.05-1.0%, Mn 0.1-5%, P <0.3%, S <0.1%, Al <0.3%, Ti <0.5%, B 0.0005-0.1%, Cr 0.01-3%, residual Fe and inevitable impurities; the low-strength steel plate matrix comprises the following components in percentage by wt.: c 0.03-0.1%, Si 0-0.1%, Mn 1.0-2.0%, P <0.1%, S <0.05%, Al <0.1%, Cr 0-0.1%, Ti 0-0.05%, balance of Fe and inevitable impurities. The tensile strength of the welded part after hot stamping is greater than that of a low-strength steel base metal, the elongation is greater than 4%, and the application requirements of the welded part in the field of automobile hot stamping are met.

IT 2067242-22-0, C 0.08-0.8, Si 0.05-1, Mn 0.1-5, P 0-0.3, S 0-0.1, Al 0-0.3, Ti 0-0.5, B 0.0005-0.1, Cr 0.01-3, Fe bal.
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-26; B23K0026-322; B23K0026-12; C22C0038-38; C22C0038-32; C22C0038-28; C22C0038-06; C22C0038-04; C22C0038-02

IPCR B23K0026-26 [I]; B23K0026-12 [I]; B23K0026-322 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]

CC 55-9 (Ferrous Metals and Alloys)

ST r aluminum alloy plated steel differential strength welded part

IT Laser welding
Plating process
Tensile strength
Welds
(aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)

IT Welding of metals
(gas metal-arc welding; aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)

IT 2067242-22-0, C 0.08-0.8, Si 0.05-1, Mn 0.1-5, P 0-0.3, S 0-0.1, Al 0-0.3, Ti 0-0.5, B 0.0005-0.1, Cr 0.01-3, Fe bal. 2490151-15-8, C 0.03-0.1, Si 0-0.1, Mn 0.5-2, Al 0-0.1, Cr 0-0.1, Fe bal., processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential strength welded part and its manuf.)

IT 2490151-16-9, C 0.1-0.25, Si 0.2-0.4, Mn 1.2-2, Al 0-0.06, Ti 0.02-0.08, Cr 0.05-0.2, Fe bal., processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or

engineered material use); PROC (Process); USES (Uses)
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)
IT 7429-90-5, Aluminum, uses 1273096-81-3, Aluminum alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(aluminum or aluminum alloy plated steel differential
strength welded part and its manuf.)

L15 ANSWER 11 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:185423 CAPLUS Full-text
DOCUMENT NUMBER: 172:169762
TITLE: Manufacture of hardened steel products with aluminum-based coatings
INVENTOR(S): Pohl, Stefan; Danger, Elisabeth; Labudde, Thorsten; Butzkamm, Juergen
PATENT ASSIGNEE(S): Muhr und Bender KG, Germany
SOURCE: PCT Int. Appl., 29pp.; Chemical Indexing Equivalent to 172:169761 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2020020644	A1	20200130	WO 2019-EP68581	20190710
DE 102018118015	A1	20200130	DE 2018-102018118015	20180725
CN 112567054	A	20210326	CN 2019-80049129	20190710
EP 3827103	A1	20210602	EP 2019-749593	20190710
PRIORITY APPLN. INFO.:			DE 2018-102018118015 A	20180725
			WO 2019-EP68581 W	20190710

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2020020644	A1	Alive	20201203
DE 102018118015	A1	Alive	20201121
CN 112567054	A	Alive	20210401
EP 3827103	A1	Alive	20210604

AB A method for producing a hardened steel product, comprises: providing a steel substrate made of a hardenable steel; coating the steel substrate with an aluminum pre-coating, the pre-coating being applied to the steel substrate with a thickness of at least 34μm; flexibly rolling the pre-coated steel substrate in order to produce a variable thickness over the length of the pre-coated steel substrate, the pre-coating being rolled out to a reduced first thickness of less than 33μm in thinner first portions and to a reduced second thickness, which is thicker than the reduced first thickness, in thicker second portions; creating a blank from the flexibly rolled steel substrate; heating the blank to the austenitization temp., diffusion processes between the base material and the pre-coating occurring; and hot-forming the heated blank, the heated blank being formed and being quickly cooled in such a way that a hardened steel product having a coating is produced.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
BATISTA LEONARDO MESQUI	2019			EP 3489386 A1	CAPLUS
Hauger, A	1995	23	40	Fertigung	
KIM HEUNG-YUN	2018			US 20180142337 A1	
MACHADO AMORIM	2017			WO 2017017521 A1	CAPLUS
SCHNEIDER DR CHRISTOPH	2017			EP 3181248 A1	
TANAHASHI HIROYUKI	2014			US 20140044987 A1	
WINKLHOFER KERRY	2008			DE 102007019196 A1	CAPLUS
Windmann, M	2014	246	17	Surface And Coatings	CAPLUS

IT 2408930-78-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrates; manuf. of hardened steel products with aluminum-based coatings)
RN 2408930-78-7 CAPLUS
CN Iron alloy, base, Fe 91-99,Mn 0.5-5,Cr 0-1,Mo 0-1,Si 0.1-0.9,C 0.2-0.5,Ti

0-0.2,V 0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Nb 0-0.1,Ni 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	91 - 99	7439-89-6
Mn	0.5 - 5	7439-96-5
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
Si	0.1 - 0.9	7440-21-3
C	0.2 - 0.5	7440-44-0
Ti	0 - 0.2	7440-32-6
V	0 - 0.2	7440-62-2
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Cu	0 - 0.1	7440-50-8
Nb	0 - 0.1	7440-03-1
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0

IPCI C21D0001-673 [I]; B21B0037-24 [I]; B21B0037-26 [I]; C23C0002-12 [I]
IPCR C21D0001-673 [I]; B21B0037-24 [I]; B21B0037-26 [I]; C23C0002-12 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 56
ST hardened steel aluminum alloy coating silicon austenizing rolling
IT Diffusion
Heat treatment
Hot-dip coating process
Metal forming
Rolling (metals)
Thermomechanical metalworking
(manuf. of hardened steel products with aluminum-based coatings)
IT Oxides (inorganic)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(manuf. of hardened steel products with aluminum-based coatings)
IT 7429-90-5, Aluminum, processes 77578-10-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coatings; manuf. of hardened steel products with aluminum-based coatings)
IT 12597-69-2, Steel, processes 2408930-78-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrates; manuf. of hardened steel products with aluminum-based coatings)

L15 ANSWER 12 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2020:178086 CAPLUS Full-text
DOCUMENT NUMBER: 172:169761
TITLE: Manufacture of hardened steel products with aluminum-based coatings
INVENTOR(S): Pohl, Stefan; Danger, Elisabeth; Labudde, Thorsten; Butzkamm, Juergen
PATENT ASSIGNEE(S): Muhr und Bender KG, Germany
SOURCE: Ger. Offen., 13pp.; Chemical Indexing Equivalent to 172:169762 (WO)
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102018118015	A1	20200130	DE 2018-102018118015	20180725
WO 2020020644	A1	20200130	WO 2019-EP68581	20190710
CN 112567054	A	20210326	CN 2019-80049129	20190710
EP 3827103	A1	20210602	EP 2019-749593	20190710

PRIORITY APPLN. INFO.: DE 2018-102018118015 A 20180725

WO 2019-EP68581 W 20190710

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102018118015	A1	Alive	20201121
WO 2020020644	A1	Alive	20201203
CN 112567054	A	Alive	20210401
EP 3827103	A1	Alive	20210604

AB A method for producing a hardened steel product, comprises: providing a steel substrate made of a hardenable steel; coating the steel substrate with an aluminum pre-coating, the pre-coating being applied to the steel substrate with a thickness of at least 34µm; flexibly rolling the pre-coated steel substrate in order to produce a variable thickness over the length of the pre-coated steel substrate, the pre-coating being rolled out to a reduced first thickness of less than 33µm in thinner first portions and to a reduced second thickness, which is thicker than the reduced first thickness, in thicker second portions; creating a blank from the flexibly rolled steel substrate; heating the blank to the austenitization temp., diffusion processes between the base material and the pre-coating occurring; and hot-forming the heated blank, the heated blank being formed and being quickly cooled in such a way that a hardened steel product having a coating is produced.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 102005031461 A1	CAPLUS
Anon				DE 102007013739 B3	CAPLUS
Anon				DE 102007019196 A1	CAPLUS
Anon				DE 102009007909 A1	CAPLUS
Anon	2019			Feuerverzinken In:Wi	
Anon				Salzgitter Flachstah	

IT 2408930-78-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrates; manuf. of hardened steel products with aluminum-based coatings)

RN 2408930-78-7 CAPLUS

CN Iron alloy, base, Fe 91-99,Mn 0.5-5,Cr 0-1,Mo 0-1,Si 0.1-0.9,C 0.2-0.5,Ti 0-0.2,V 0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Nb 0-0.1,Ni 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	91 - 99	7439-89-6
Mn	0.5 - 5	7439-96-5
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
Si	0.1 - 0.9	7440-21-3
C	0.2 - 0.5	7440-44-0
Ti	0 - 0.2	7440-32-6
V	0 - 0.2	7440-62-2
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Cu	0 - 0.1	7440-50-8
Nb	0 - 0.1	7440-03-1
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0

IPCI C23F0017-00 [I]; C23C0002-12 [I]; C22C0038-04 [I]
IPCR C23F0017-00 [I]; C22C0038-04 [I]; C23C0002-12 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 56
ST hardened steel aluminum alloy coating silicon austenizing rolling
IT Diffusion
Heat treatment
Hot-dip coating process
Metal forming
Rolling (metals)
Thermomechanical metalworking
(manuf. of hardened steel products with aluminum-based

coatings)
IT Oxides (inorganic)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(manuf. of hardened steel products with aluminum-based coatings)
IT 7429-90-5, Aluminum, processes 77578-10-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coatings; manuf. of hardened steel products with aluminum-based coatings)
IT 12597-69-2, Steel, processes 2408930-78-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrates; manuf. of hardened steel products with aluminum-based coatings)

L15 ANSWER 13 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:2139176 CAPLUS Full-text
TITLE: The influence of coverage for high frequency mechanical impact treatment of different steel grades
AUTHOR(S): Schubnell, J.; Eichheimer, C.; Ernould, C.; Maciolek, A.; Rebelo-Kornmeier, J.; Farajian, M.
CORPORATE SOURCE: Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany
SOURCE: Journal of Materials Processing Technology (2020), 277, 116437
CODEN: JMPTEF; ISSN: 0924-0136
DIGITAL OBJECT ID: 10.1016/j.jmatprotec.2019.116437
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB The high frequency mech. impact (HFMI) process is a comparably new, manually-driven machine hammer peening (MHP) process applied to increase the fatigue performance of metallic components. The HFMI-process is characterized by a large no. of impacts, also when the tool was used with a high feed rate. This leads to a fast satn. and highly plastic deformation at the surface layer. Exptl. investigations of the surface topog., near-surface residual stresses, and work hardening were performed on HFMI-treated, flat specimens made of S355J2, S690QL and S960QL steel grade to investigate the influence of the process parameters on the surface conditions. The residual stress state, exptl. detd. by neutron diffraction, was supplemented by the numerical simulation of the HFMI-process. For this, an elasto-viscoplastic material model was implemented and calibrated with exptl. test data. As a unified parameter for the process quality, a representative coverage value, defined as the no. of impacts per ref. surface area, was calcd. for different sets of process parameters. This coverage value was also used to compare the numerical simulation and the exptl. investigations by neutron diffraction techniques of the HFMI-induced residual stress field. It is shown, that high coverage has a strong effect on the depth of indentation and in the work hardening effect for mild and medium steel grade. Only slight changes of the process-induced residual stresses could be obsd. with an increasing coverage.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
AASHTO	2012			LRFD Bridge Construc	
Anon				Le Quiellec, G., 201	
Anon				VDI-Richtlinie: Masc	
Armstrong, P	1966			A Mathematical Repre	
Bagherifard, S	2011	10	1923	Procedia Eng	
Baier, E	2015	84	629	Stahlbau, 10.1002/st	
Berg, J	2014	3	71	Procedia Mater Sci	CAPLUS
Bleicher, F	2012	61	375	CIRP Ann, 10.1016/J.	
Bohme, W	2007			FAT-Recommendation:D	
Brokmeier, H	2011	1	87	Nucl Instrum Methods	
Cao, X	2010	256	6297	Appl Surf Sci, 10.10	CAPLUS
Chaboche, J	1986	2	149	Int J Plast	
Chaboche, J	1989	5	247	Int J Plast	
Chaboche, J	2009	3	1	Nonlinear Comput Mec	

Dassault Systemes Simul	2014			Abaqus Documentation	
Deng, C	2016	92	211	Int J Fatigue	CAPLUS
Durr, A	2007			Zur Ermudungsfestigk	
Ernould, C	2017			70th IIW Annual Asse	
Ernould, C	2017			Numerical Simulation	
Erz, A	2012		352	Proceedings of the 1	
Foehrenbach, J	2016	60	749	Weld World	CAPLUS
Frederick, C	2007	24	1	Mater High Temp	
Ghahremani, K	2015	59	391	Weld World	
Haagensen, P	2010			IIW Recommendations	
Harati, E	2016	2	2483	Procesida Struct Int	
Hardenacke, V	2015			68th IIW Annual Asse	
Hessert, R	2008			ICSP-10	
Hobbacher, A	2016			2th illust ed Spring	
Hofmann, M	2006	385-3	1035	Phys B Condens Matte	CAPLUS
Hutchings, M	2005			Introduction to the	
Kirk, D	1993		183	Proc Of the 5th Int	
Knysh, V	2018	54	421	Biomater Sci, 10.100	CAPLUS
Kornmeier, J	2014	768-7	52	Mater Sci Forum	
Kornmeier, J	2011		22	Meas Sci Technol	
Lienert, F	2014	768-7	526	Mater Sci Forum, 10.	
Lobanov, L	2006	42	54	Mater Sci, 10.1007/s	CAPLUS
Lohe, D	2002			Handbook of Residual	
Lombardo, D	1996		493	Proceedings of the 6	
Macherauch, E	1985		237	Ermudungsverhalten M	
Maciolek, A	2017			Implementierung eine	
Mannens, R	2018	71	166	Procedia Cirp, 10.10	
Marquis, G	2016			IIW Recommendation f	
Micoulaut, M	2006		25	9th International Co	
Mikkola, E	2017	94	16	Int J Fatigue	
Mikkola, E	2013	66	161	Procedia Eng	
Mordyuk, B	2016	659	119	Mater Sci Eng A, 10.	CAPLUS
Rouquette, S	2009	209	3879	J Mater Process Tech	CAPLUS
SAE International	2009			AMS 2430, Shot Peeni	
SAE International	2003			SAE J 2277	
Saroun, J	2013	46	628	J Appl Cryst	CAPLUS
Scheil, J	2013	554-5	1819	Key Eng Mater, 10.40	
Scholtes, B	1989		3	Grundlagen der mecha	
Schubnell, J	2018	49		Materwiss Werksttech	
Schubnell, J	2017	61		Weld World, 10.1007/	CAPLUS
Schulze, V	2016	65	809	CIRP Ann, 10.1016/J.	
Schulze, V	2006			Modern Mechanical Su	
Schwarzer, J	2002			8th International Co	
Simunek, D	2013			Numerical Simulation	
Statnikov, E	1996			IIW Document XIII-16	
Steitz, M	2013	554-5	1887	Key Eng Mater, 10.40	
Suzuki, T	2014	996	736	Adv Mater Res, 10.40	
Tang, L	2018			Residual Stress Anal	
Ummenhofer, T	2011			REFRESH, Life Extens	
Weich, I	2009			Ermudungsverhalten m	
Wied, J	2011			Oberflachenbehandlun	
Wohlfahrt, H	2000		55	Mechanische Oberflac	
Yekta, R	2013	55	245	Int J Fatigue	
Yekta, R	2012			No Acceptance Criter	
Yildirim, H	2013			Design Aspects of Hi	
Yildirim, H	2012	44	168	Int J Fatigue	CAPLUS
Yin, F	2014	92	28	Comput Mater Sci	CAPLUS
Yuan, K	2016	92	321	Int J Fatigue, 10.10	
Zaverl, F	1978	75	14	J Nucl Mater	CAPLUS

IT INDEXING IN PROGRESS
IT 12604-89-6
RL: PRP (Properties)
(influence of coverage for high frequency mech. impact treatment of different steel grades)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5

Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-11 (Ferrous Metals and Alloys)
ST steel high frequency mech impact treatment simulation
IT Plastic deformation
Residual stress
Simulation and Modeling
Strain hardening
(influence of coverage for high frequency mech. impact treatment of different steel grades)
IT 12604-89-6 65682-90-8 191743-86-9
RL: PRP (Properties)
(influence of coverage for high frequency mech. impact treatment of different steel grades)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 14 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:1450710 CAPLUS Full-text
TITLE: The influence of the heating rate of cemented constructional steels on the growth of austenitic grain in the process of high-temperature holding
AUTHOR(S): Kukareko, V. A.; Valko, A. L.; Chichin, A. N.
CORPORATE SOURCE: Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus, Minsk, Belarus
SOURCE: Vestsi Natsyyanal'nai Akademii Navuk Belarusi, Seryya Fizika-Tekhnichnykh Navuk (2018), (4), 399-406
CODEN: VABNFA; ISSN: 1561-8358
DIGITAL OBJECT ID: 10.29235/1561-8358-2018-63-4-399-406
PUBLISHER: Vydavetski Dom "Belaruskaya Navuka"
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The influence of the heating mode of samples of constructional cemented steels 20KhNZA, 20KhGNR and 15KhGN2TA on the value of austenite grain after high-temp. isothermal aging at 1000 °C is studied. It is shown that the heating of steels at a rate of 1.2-3.0 °C/min in the phase-transformation interval stabilizes the grain structure of the steels and leads to a slowing down of the kinetics of the growth of austenite grains during prolonged high-temp. aging, which makes it possible to increase the temp. of the chem.-thermal treatment of steels. It is concluded that the stabilization of the grain structure of steels is assocd. with the formation of segregation of impurity atoms and particles at grain boundaries with high-angle disorientation during slow heating, which prevents migration of grain boundaries in the process of prolonged high-temp. aging. A high-temp. chem.-thermal treatment of a batch of billets from steel 20KhNZA under exptl. conditions with stepwise heating in the phase-transformation interval provided a qual. fine-grained structure of the cemented layer.
IT INDEXING IN PROGRESS
IT 37312-00-8, 20KhGNR
RL: TEM (Technical or engineered material use); USES (Uses)
(influence of heating rate of cemented constructional steels on growth of austenitic grain in process of high-temp. holding)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0

Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55 (Ferrous Metals and Alloys)
ST steel austenitic grain growth heating rate holding temp
IT Grain boundaries
Grain size
Heat treatment
Microhardness
Microstructure
Quenching (cooling)
(influence of heating rate of cemented constructional steels on growth of austenitic grain in process of high-temp. holding)
IT 37312-00-8, 20KhGNR 61431-72-9, 15KhGN2TA
RL: TEM (Technical or engineered material use); USES (Uses)
(influence of heating rate of cemented constructional steels on growth of austenitic grain in process of high-temp. holding)

L15 ANSWER 15 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:1388398 CAPLUS Full-text
DOCUMENT NUMBER: 171:219714
TITLE: Composite manufacturing method of acid leaching stirrer by preparing iron-based amorphous coating on acid leaching stirring shaft and paddles by supersonic flame spraying
INVENTOR(S): Zhang, Linwei; Zhou, Yulin; Wang, Rixin; Yu, Jiuming; Hao, Changyi; Wang, Jiawei; Yang, Xuebing; Zeng, Weijun
PATENT ASSIGNEE(S): Institute of Applied Physics, Jiangxi Academy of Sciences, Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 7pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 110029300	A	20190719	CN 2019-10257862	20190401

PRIORITY APPLN. INFO.: CN 2019-10257862 20190401
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 110029300	A	Alive	20201121

AB The title manufg. method includes (1) processing heat-treated carbon steel or stainless steel into stirring shaft and paddles; (2) deoiling sand sanding; (3) prepg. iron-based amorphous coating on the acid leaching stirring shaft and paddles by supersonic flame spraying with iron-based amorphous powder as a spraying material; (4) checking; and (5) welding the acid leaching stirring shaft and paddles or connecting via screws. The iron-based amorphous powder comprises (by mass%) Cr 0-25, Mo 0-10, W 0-5, Nb 0-12, Lu 0-4, Mn 0-7, B 0-5, C 0-4, Si 0-3, RE 0-2, Fe bal. The obtained acid leaching stirring shaft and paddles have long service life.
IT 2364624-49-5, Misch 0-2, boron 0-5, carbon 0-4, chromium 0-25, lutetium 0-4, manganese 0-7, molybdenum 0-10, niobium 0-12, silicon 0-3, tungsten 0-5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(composite manufg. method of acid leaching stirrer by prepg. iron-based amorphous coating on acid leaching stirring shaft and paddles

by supersonic flame spraying)
RN 2364624-49-5 CAPLUS
CN Iron alloy, base, Fe 23-100,Cr 0-25,Nb 0-12,Mo 0-10,Mn 0-7,B 0-5,W 0-5,C 0-4,Lu 0-4,Si 0-3,misch metal 0-2 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	23 - 100	7439-89-6
Cr	0 - 25	7440-47-3
Nb	0 - 12	7440-03-1
Mo	0 - 10	7439-98-7
Mn	0 - 7	7439-96-5
B	0 - 5	7440-42-8
W	0 - 5	7440-33-7
C	0 - 4	7440-44-0
Lu	0 - 4	7439-94-3
Si	0 - 3	7440-21-3
Misch metal	0 - 2	8049-20-5

IPCI C23C0004-129; C22C0045-02; C23C0004-067
IPCR C23C0004-129 [I]; C22C0045-02 [I]; C23C0004-067 [I]
CC 56-4 (Nonferrous Metals and Alloys)
Section cross-reference(s): 47
ST composite manufg acid leaching stirrer prepn iron amorphous coating
IT Coating materials
Flame spray coating process
Heat treatment
Leaching
Powder metallurgy
Powder spray coating materials
Stirrers
Welding of metals
(composite manufg. method of acid leaching stirrer by prepg. iron-based amorphous coating on acid leaching stirring shaft and paddles by supersonic flame spraying)
IT Metallic glasses
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(composite manufg. method of acid leaching stirrer by prepg. iron-based amorphous coating on acid leaching stirring shaft and paddles by supersonic flame spraying)
IT 11109-50-5, SS304 37268-90-9, processes 2364624-49-5, Misch 0-2, boron 0-5, carbon 0-4, chromium 0-25, lutetium 0-4, manganese 0-7, molybdenum 0-10, niobium 0-12, silicon 0-3, tungsten 0-5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(composite manufg. method of acid leaching stirrer by prepg. iron-based amorphous coating on acid leaching stirring shaft and paddles by supersonic flame spraying)

L15 ANSWER 16 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:1254928 CAPLUS Full-text
DOCUMENT NUMBER: 171:98349
TITLE: Production of cold-rolled flat steel products having metal anti-corrosion layers
INVENTOR(S): Mraczek, Klemens; Muhr, Andreas; Haneder, Bernhard
PATENT ASSIGNEE(S): Voestalpine Stahl GmbH, Austria
SOURCE: PCT Int. Appl., 38pp.; Chemical Indexing Equivalent to 171:98344 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2019121793	A1	20190627	WO 2018-EP85664	20181218
DE 102017223633	A1	20190627	DE 2017-102017223633	20171221
EP 3728654	A1	20201028	EP 2018-826307	20181218
US 20200325552	A1	20201015	US 2020-16956301	20200619

PRIORITY APPLN. INFO.: DE 2017-102017223633 A 20171221
WO 2018-EP85664 W 20181218

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2019121793	A1	Alive	20201219
DE 102017223633	A1	Alive	20201121
EP 3728654	A1	Alive	20201202
US 20200325552	A1	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A cold-rolled flat steel contains, in addn. to iron and unavoidable impurities, (in wt.%): C: 0.01-0.35%, Mn: 1-4%, Si: 0.5-2.5%, Nb: up to 0.1%, Ti: 0.015-0.1%, P: up to 0.1%, Al: up to 0.15%, S: up to 0.01%, N: up to 0.1%, and optionally one or more elements from the group of rare earth metals, Mo, Cr, Zr, V, W, Co, Ni, B, Cu, Ca, with rare earth metals: up to 0.2%, Mo: up to 1%, Cr: up to 3%, Zr: up to 1%, V: up to 1%, W: up to 1%, Co: up to 1%, Ni: up to 2%, B: up to 0.1%, Cu: up to 3%, Ca: up to 0.015%. The flat steel products are manufd. by: melting then casting the steel melt to form a semi-finished product; hot-rolling the semi-finished product at 820-1000°C to form a hot strip; winding the hot strip at a temp. between room temp. and 750°C to form a coil; annealing the hot strip at 530-950°C for 1-50 h; cold-rolling the annealed hot strip to form a cold-rolled flat steel product in one or more stages with a total cold-rolling degree of at least 45%; final annealing of the cold-rolled flat steel product at 650-920°C for 30-1500 s; and applying a zinc-based metal anti-corrosion layer by electrolytic galvanizing or hot dip galvanizing of the cold-rolled and finally-annealed flat steel product. As a result of the final annealing of the cold-rolled flat steel product, an Si enrichment layer is created between a surface and a base material of the cold-rolled and finally-annealed flat steel product, the max. Si content of which is higher by a factor of 3-8 than the Si content of the base material and which has a depth of 10 nm to 1 μm.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
ARLAZAROV ARTEM	2017			EP 3146083 A1	CAPLUS
HAGA JUN	2013			JP 2013032582 A	CAPLUS
NAKAGAITO TATSUYA	2007			JP 2007224416 A	CAPLUS

IT 2351042-49-2P
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(sheets; prodn. of cold-rolled flat steel products having metal anti-corrosion layers)

RN 2351042-49-2 CAPLUS

CN Iron alloy, base, Fe 78-98,Mn 1-4,Cr 0-3,Cu 0-3,Si 0.5-2.5,Ni 0-2,Al 0-1.5,Co 0-1,Mo 0-1,V 0-1,W 0-1,Zr 0-1,C 0-0.4,misch metal 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1,N 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	78 - 98	7439-89-6
Mn	1 - 4	7439-96-5
Cr	0 - 3	7440-47-3
Cu	0 - 3	7440-50-8
Si	0.5 - 2.5	7440-21-3
Ni	0 - 2	7440-02-0
Al	0 - 1.5	7429-90-5
Co	0 - 1	7440-48-4
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
W	0 - 1	7440-33-7
Zr	0 - 1	7440-67-7
C	0 - 0.4	7440-44-0
Misch metal	0 - 0.2	8049-20-5
Nb	0 - 0.2	7440-03-1
Ti	0 - 0.2	7440-32-6
B	0 - 0.1	7440-42-8
N	0 - 0.1	17778-88-0

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P                 0   -   0.1      7723-14-0

IPCI C21D0006-00 [I]; B21B0001-24 [I]; B21B0001-26 [I]; B21B0001-28 [I];
     C21D0007-02 [I]; C21D0007-10 [I]; C21D0008-02 [I]; C21D0008-04 [I];
     C23C0002-00 [I]; C21D0009-46 [I]; C21D0009-48 [I]; C21D0001-26 [I];
     C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-12 [I]; C22C0038-14 [I];
     C25F0001-06 [I]; C23G0001-08 [I]; B21B0001-22 [I]
IPCR C21D0006-00 [I]; B21B0001-22 [I]; B21B0001-24 [I]; B21B0001-26 [I];
     B21B0001-28 [I]; C21D0001-26 [I]; C21D0007-02 [I]; C21D0007-10 [I];
     C21D0008-02 [I]; C21D0008-04 [I]; C21D0009-46 [I]; C21D0009-48 [I];
     C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-12 [I]; C22C0038-14 [I];
     C23C0002-00 [I]; C23G0001-08 [I]; C25F0001-06 [I]
CC   55-3 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   cold rolling annealing flat steel zinc anticorrosion coating
IT   Galvanizing
        (electrogalvanizing; prodn. of cold-rolled flat steel
        products having metal anti-corrosion layers)
IT   Annealing
     Anticorrosive coating materials
     Casting of metals
     Cold rolling
     Hot rolling
     Hot-dip galvanizing
        (prodn. of cold-rolled flat steel products having metal
        anti-corrosion layers)
IT   7440-66-6P, Zinc, preparation
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (coatings; prodn. of cold-rolled flat steel
        products having metal anti-corrosion layers)
IT   2351042-49-2P
     RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical
     process); TEM (Technical or engineered material use); PREP (Preparation);
     PROC (Process); USES (Uses)
        (sheets; prodn. of cold-rolled flat steel products having
        metal anti-corrosion layers)


L15  ANSWER 17 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2019:1241982  CAPLUS Full-text
DOCUMENT NUMBER:         171:98344
TITLE:                   Production of cold-rolled flat steel products having
                         metal anti-corrosion layers
INVENTOR(S):             Mraczek, Klemens; Muhr, Andreas; Haneder, Bernhard
PATENT ASSIGNEE(S):      Voestalpine Stahl GmbH, Austria
SOURCE:                  Ger. Offen., 17pp.; Chemical Indexing Equivalent to
                         171:98349 (WO)
                         CODEN: GWXXBX
DOCUMENT TYPE:           Patent
LANGUAGE:                German
FAMILY ACC. NUM. COUNT:  2
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     DE 102017223633      A1   20190627    DE 2017-102017223633     20171221
     WO 2019121793        A1   20190627    WO 2018-EP85664          20181218
     EP 3728654           A1   20201028    EP 2018-826307           20181218
     US 20200325552       A1   20201015    US 2020-16956301         20200619
PRIORITY APPLN. INFO.:                     DE 2017-102017223633 A   20171221
                                           WO 2018-EP85664      W   20181218
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  ------------    -----------
     DE 102017223633      A1   Alive           20201121
     WO 2019121793        A1   Alive           20201219
     EP 3728654           A1   Alive           20201202
     US 20200325552       A1   Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   A cold-rolled flat steel contains, in addn. to iron and unavoidable
     impurities, (in wt.%): C: 0.01-0.35%, Mn: 1-4%, Si: 0.5-2.5%, Nb: up to
     0.1%, Ti: 0.015-0.1%, P: up to 0.1%, Al: up to 0.15%, S: up to 0.01%, N:
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up to 0.1%, and optionally one or more elements from the group of rare earth metals, Mo, Cr, Zr, V, W, Co, Ni, B, Cu, Ca, with rare earth metals: up to 0.2%, Mo: up to 1%, Cr: up to 3%, Zr: up to 1%, V: up to 1%, W: up to 1%, Co: up to 1%, Ni: up to 2%, B: up to 0.1%, Cu: up to 3%, Ca: up to 0.015%. The flat steel products are manufd. by: melting then casting the steel melt to form a semi-finished product; hot-rolling the semi-finished product at 820-1000°C to form a hot strip; winding the hot strip at a temp. between room temp. and 750°C to form a coil; annealing the hot strip at 530-950°C for 1-50 h; cold-rolling the annealed hot strip to form a cold-rolled flat steel product in one or more stages with a total cold-rolling degree of at least 45%; final annealing of the cold-rolled flat steel product at 650-920°C for 30-1500 s; and applying a zinc-based metal anti-corrosion layer by electrolytic galvanizing or hot dip galvanizing of the cold-rolled and finally-annealed flat steel product. As a result of the final annealing of the cold-rolled flat steel product, an Si enrichment layer is created between a surface and a base material of the cold-rolled and finally-annealed flat steel product, the max. Si content of which is higher by a factor of 3-8 than the Si content of the base material and which has a depth of 10 nm to 1 μm.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 102012013113 A1	CAPLUS
Anon				DE 102015111866 A1	CAPLUS
Anon				DE 102015112886 A1	CAPLUS
Anon				DE 102015112889 A1	CAPLUS
Anon				EP 2383353 A2	CAPLUS

IT 2351042-49-2P
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(sheets; prodn. of cold-rolled flat steel products having metal anti-corrosion layers)
RN 2351042-49-2 CAPLUS
CN Iron alloy, base, Fe 78-98,Mn 1-4,Cr 0-3,Cu 0-3,Si 0.5-2.5,Ni 0-2,Al 0-1.5,Co 0-1,Mo 0-1,V 0-1,W 0-1,Zr 0-1,C 0-0.4,misch metal 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1,N 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	78 - 98	7439-89-6
Mn	1 - 4	7439-96-5
Cr	0 - 3	7440-47-3
Cu	0 - 3	7440-50-8
Si	0.5 - 2.5	7440-21-3
Ni	0 - 2	7440-02-0
Al	0 - 1.5	7429-90-5
Co	0 - 1	7440-48-4
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
W	0 - 1	7440-33-7
Zr	0 - 1	7440-67-7
C	0 - 0.4	7440-44-0
Misch metal	0 - 0.2	8049-20-5
Nb	0 - 0.2	7440-03-1
Ti	0 - 0.2	7440-32-6
B	0 - 0.1	7440-42-8
N	0 - 0.1	17778-88-0
P	0 - 0.1	7723-14-0

IPCI C22C0038-04 [I]; C22C0038-38 [I]; C22C0038-42 [I]; C22C0038-20 [I]
IPCR C22C0038-04 [I]; C22C0038-20 [I]; C22C0038-38 [I]; C22C0038-42 [I]
CC 55-3 (Ferrous Metals and Alloys)
Section cross-reference(s): 56
ST cold rolling annealing flat steel zinc anticorrosion coating
IT Galvanizing
(electrogalvanizing; prodn. of cold-rolled flat steel products having metal anti-corrosion layers)
IT Annealing

Anticorrosive coating materials
Casting of metals
Cold rolling
Hot rolling
Hot-dip galvanizing
(prodn. of cold-rolled flat steel products having metal anti-corrosion layers)

IT 7440-66-6P, Zinc, preparation
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(coatings; prodn. of cold-rolled flat steel products having metal anti-corrosion layers)

IT 2351042-49-2P
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(sheets; prodn. of cold-rolled flat steel products having metal anti-corrosion layers)

L15 ANSWER 18 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:1019962 CAPLUS Full-text
DOCUMENT NUMBER: 171:30626
TITLE: Ultra-high strength and excellent ductility in multi-layer steel sheet of austenitic hadfield and martensitic hot-press-forming steels
AUTHOR(S): Park, Jaeyeong; Jo, Min Cheol; Song, Taejin; Kim, Hyoung Seop; Sohn, Seok Su; Lee, Sunghak
CORPORATE SOURCE: Center for Advanced Aerospace Materials, Pohang University of Science and Technology, Pohang, 790-784, S. Korea
SOURCE: Materials Science & Engineering, A: Structural Materials: Properties, Microstructure and Processing (2019), 759, 320-328
CODEN: MSAPE3; ISSN: 0921-5093
DIGITAL OBJECT ID: 10.1016/j.msea.2019.05.046
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB An austenitic Hadfield steel sheet shows a relatively low yield strength of 0.4-0.5 GPa and serrated flows in spite of excellent tensile strength and ductility along with highly-sustained strain hardening. In order to overcome the shortcomings, a multi-layer steel (MLS) sheet was fabricated by a roll-bonding with an ultra-high-strength martensitic hot-press-forming (HPF) steel sheet. Near the Hadfield/HPF interface, the carburized and decarburized layers were formed by the carbon diffusion from the Hadfield (1.2% of C) to HPF (0.23% of C) layers, and could generate a kind of very thin multi-layers of 35 μm in thickness. All tensile properties of the Hadfield/HPF MLS sheet (yield strength; 946 MPa, tensile strength; 1291 MPa, elongation; 44.5%) were superior to those of the Hadfield sheet. Interestingly, the persistent elongation up to 44.5%, which is higher than that of the Hadfield steel, in the present MLS sheet is a quite unique and interesting characteristic. The simultaneous enhancement of strength and ductility of the MLS sheet was explained by the contributions of (1) populated twin formation, (2) generation of geometrically necessary dislocations (GNDs), and (3) increase of back stress inside thin interfacial layers.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				K. Sato, Q. Yu, J. H	
Barbier, D	2009	500	196	Mater Sci Eng A	
Bouaziz, O	2016	18	56	Adv Eng Mater	CAPLUS
Calcagnotto, M	2011	59	658	Acta Mater	CAPLUS
Cetin, A	2012	60	2265	Acta Mater	CAPLUS
Chateau, J	2010	240	012023	J Phys Conf Ser	
Chen, L	2007	47	1804	ISIJ Int	CAPLUS
Curtze, S	2010	58	5129	Acta Mater	CAPLUS
Dini, G	2010	64	15	Mater Lett	CAPLUS
Dinsdale, A	1991	15		Calphad	CAPLUS
Dumay, A	2008	483-4	184	Mater Sci Eng A	

Eshelby, J	1951	42	351	Lond Edinb Dublin Ph	
Fan, D	2009	80	241	Steel Res Int	CAPLUS
Frommeyer, G	2003	43	438	ISIJ Int	CAPLUS
Grassel, O	2000	16	1391	Int J Plast	CAPLUS
Gwon, H	2019	25	594	Met Mater Int	CAPLUS
Han, Y	2012	553	192	Mater Sci Eng A	CAPLUS
Hild, F	2006	42	69	Strain	
Hirth, J	1982			Theory of Dislocatio	
Inoue, J	2008	59	1055	Scripta Mater	CAPLUS
Kang, M	2017	700	387	Mater Sci Eng A	CAPLUS
Kang, S	2010	527	745	Mater Sci Eng A	
Kim, J	2019			Met Mater Int	
Koseki, T	2014	55	227	Mater Trans	CAPLUS
Kubin, L	2003	48	119	Scripta Mater	CAPLUS
Kurt, B	2009	60	1035	Mater Char	CAPLUS
Laws, N	1977	7	91	J Elast	
Lebedkina, T	2009	519	147	Mater Sci Eng A	
Lee, D	1988	23	558	J Mater Sci	CAPLUS
Lee, Y	2000	31	355	Metall Mater Trans A	
Li, Y	2018	731	377	Mater Sci Eng A	CAPLUS
Liu, B	2017	679	172	Mater Sci Eng A	CAPLUS
Ma, X	2016	116	43	Acta Mater	CAPLUS
Matlock, D	2012	15	1	JESTECH	
Morito, S	2005	45	91	ISIJ Int	CAPLUS
Nambu, S	2009	69	1936	Compos Sci Technol	CAPLUS
Nambu, S	2009	60	221	Scripta Mater	CAPLUS
Ojima, M	2009	529	16	Mater Sci Eng A	
Ojima, M	2012	66	139	Scripta Mater	CAPLUS
Pan, B	2009	20	1	Meas Sci Technol	
Park, J	2017	7	40231	Sci Rep	CAPLUS
Park, K	2001	7	95	Met Mater Int	CAPLUS
Saleh, A	2011	528	4537	Mater Sci Eng A	
Scott, C	2011	102	538	Int J Mater Res	CAPLUS
Semiatin, S	1979	10	85	Metall Trans A	
Seok, M	2016	121	164	Acta Mater	CAPLUS
Srivastava, A	2008	43	5654	J Mater Sci	CAPLUS
Ueji, R	2012	47	7946	J Mater Sci	CAPLUS
Ueji, R	2008	59	963	Scripta Mater	CAPLUS
Wu, X	2015	112	14501	Proc Natl Acad Sci U	CAPLUS
Xie, G	2011	52	1709	Mater Trans	CAPLUS
Yan, F	2014	81	487	Acta Mater	CAPLUS
Yang, M	2016	4	145	Mater Res Lett	CAPLUS
Yang, W	1990	25	1821	J Mater Sci	CAPLUS
Zuidema, B	1987	18	1629	Metall Trans A	

IT 2334123-60-1, Fe bal., C 0.23, Mn 1.2, Si 0.41, Cr 0.2, Ti 0-0.06, B 0-0.06, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(ultra-high strength and excellent ductility in multi-layer steel sheet of austenitic hadfield and martensitic hot-press-forming steels)
RN 2334123-60-1 CAPLUS
CN Steel, Fe 98,Mn 1.2,Si 0.4,C 0.2,Cr 0.2,B 0-0.1,Ti 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	98	7439-89-6
Mn	1.2	7439-96-5
Si	0.4	7440-21-3
C	0.2	7440-44-0
Cr	0.2	7440-47-3
B	0 - 0.1	7440-42-8
Ti	0 - 0.1	7440-32-6

CC 55-12 (Ferrous Metals and Alloys)
ST steel multilayer sheet strength ductility microstructure
IT Elongation, mechanical
Hot-press molding
Microstructure
Multilayers
Sheet materials

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     Solid-solid interface
     Strain hardening
     Stress-strain relationship
     Tensile strength
     Yield strength
        (ultra-high strength and excellent ductility in multi-layer
        steel sheet of austenitic hadfield and martensitic
        hot-press-forming steels)
IT   2334123-57-6, Fe bal., C 1.2, Mn 13.6, Si 0.2   2334123-60-1, Fe
     bal., C 0.23, Mn 1.2, Si 0.41, Cr 0.2, Ti 0-0.06, B 0-0.06, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (ultra-high strength and excellent ductility in multi-layer
        steel sheet of austenitic hadfield and martensitic
        hot-press-forming steels)
OS.CITING REF COUNT:     7     THERE ARE 7 CAPLUS RECORDS THAT CITE THIS RECORD
                               (7 CITINGS)


L15  ANSWER 19 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2019:949375  CAPLUS Full-text
DOCUMENT NUMBER:          170:609630
TITLE:                    Al plated steel pipe parts by STAF method
INVENTOR(S):              Maki, Jun; Fujita, Soshi; Nakamura, Toyomitsu
PATENT ASSIGNEE(S):       Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE:                   Jpn. Kokai Tokkyo Koho, 21pp.
                          CODEN: JKXXAF
DOCUMENT TYPE:            Patent
LANGUAGE:                 Japanese
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     JP 2019073778         A    20190516    JP 2017-201702           20171018
     JP 6939393            B2   20210922
PRIORITY APPLN. INFO.:                     JP 2017-201702           20171018
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS           STATUS DATE
     ---------------      ----  -------------    -----------
     JP 2019073778         A    Alive            20201121
AB   The present invention relates to an Al plated steel pipe parts
     comprising a hollow portion having a predetd. cross-sectional shape; and a
     flange portion projecting from the outer surface of the hollow portion;
     wherein the hollow portion and the flange portion are made of the same
     steel material as a material, and the surface of the hollow portion and
     the flange portion is coated with a plating layer contg. at least one
     of an Al-Fe-based alloy and an Al-Fe-Si-based alloy.  The Al plated
     steel pipe parts has thickness of the plating layer is in the range of
     5-50 μm, and the surface roughness of the plating layer at the flange
     portion is in the range of 0.3-1.2 μ m as a center line av. roughness
     Ra defined by JIS B0610.  The Al-plated steel pipe part has excellent
     spot weldability manufd. by processing an Al-plated steel pipe by the
     STAF method.
IT   2320493-55-6, Aluminum 0-0.1, boron 0.0001-0.1, carbon 0.15-0.5,
     chromium 0-1.5, iron bal., manganese 0.6-3, nitrogen 0-0.006, phosphorus
     0-0.01, silicon 0.01-2, titanium 0.01-0.1
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (aluminum plated steel pipe parts by STAF method)
RN   2320493-55-6  CAPLUS
CN   Iron alloy, base, Fe 93-99,Mn 0.6-3,Si 0-2,Cr 0-1.5,C 0.2-0.5,Al 0-0.1,B
     0-0.1,Ti 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      93   -  99        7439-89-6
    Mn      0.6  -  3         7439-96-5
    Si      0    -  2         7440-21-3
    Cr      0    -  1.5       7440-47-3
    C       0.2  -  0.5       7440-44-0
    Al      0    -  0.1       7429-90-5
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    B       0   -   0.1       7440-42-8
    Ti      0   -   0.1       7440-32-6

IPCI C23C0002-12 [I]; C23C0002-26 [I]; C22C0038-00 [I]; C22C0038-04 [I];
     C22C0038-38 [I]; B21D0026-035 [N]; B21D0026-059 [N]; C22C0021-02 [N];
     C21D0009-08 [N]; C23C0002-12 [I]; C23C0002-26 [I]; C22C0038-00 [I];
     C22C0038-04 [I]; C22C0038-38 [I]; B21D0026-035 [N]; B21D0026-059 [N];
     C22C0021-02 [N]; C21D0009-08 [N]
IPCR C23C0002-12 [I]; C22C0038-00 [I]; C22C0038-04 [I]; C22C0038-38 [I];
     C23C0002-26 [I]
CC   55-6 (Ferrous Metals and Alloys)
ST   aluminum plating steel pipe parts
IT   Coating materials
     Pipes and Tubes
        (aluminum plated steel pipe parts by STAF method)
IT   12043-58-2
     RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
        (aluminum plated steel pipe parts by STAF method)
IT   2320493-55-6, Aluminum 0-0.1, boron 0.0001-0.1, carbon 0.15-0.5,
     chromium 0-1.5, iron bal., manganese 0.6-3, nitrogen 0-0.006, phosphorus
     0-0.01, silicon 0.01-2, titanium 0.01-0.1
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (aluminum plated steel pipe parts by STAF method)
IT   1314-13-2, Zinc oxide, uses   7429-90-5, Aluminum, uses   11114-60-6
     11116-16-8, Titanium nitride   11122-26-2   12705-37-2, Chromium nitride
     RL: TEM (Technical or engineered material use); USES (Uses)
        (aluminum plated steel pipe parts by STAF method)


L15  ANSWER 20 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2019:903363  CAPLUS Full-text
DOCUMENT NUMBER:          170:588989
TITLE:                    Piercer plug made of seamless steel, and its
                          manufacturing method
INVENTOR(S):              Hidaka, Yasuyoshi; Shirasawa, Naoya; Miyai, Tatsuya
PATENT ASSIGNEE(S):       Nippon Steel Corporation, Japan
SOURCE:                   PCT Int. Appl., 27pp.
                          CODEN: PIXXD2
DOCUMENT TYPE:            Patent
LANGUAGE:                 Japanese
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    --------------------     --------
     WO 2019087510         A1   20190509    WO 2018-JP29879          20180809
     CN 111315906          A    20200619    CN 2018-80071094         20180809
     BR 112020002943       A2   20200811    BR 2020-112020002943     20180809
     EP 3705591            A1   20200909    EP 2018-874192           20180809
     EP 3705591            B1   20210317
     JP 6860083            B2   20210414    JP 2019-549868           20180809
     US 20200263282        A1   20200820    US 2020-16646739         20200312
PRIORITY APPLN. INFO.:                      JP 2017-212753       A   20171102
                                            WO 2018-JP29879      W   20180809
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS           STATUS DATE
     ---------------      ----  -------------    -----------
     WO 2019087510         A1   Alive            20201220
     CN 111315906          A    Alive            20201121
     BR 112020002943       A2   Alive            20201202
     EP 3705591            A1   Indeterminate    20210318
     EP 3705591            B1   Indeterminate    20210318
     JP 6860083            B2   Alive            20210422
     US 20200263282        A1   Alive            20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The piercer plug comprises the following component in mass (%): 0.15-0.3
     of carbon, 0.4-1.2 of silicon, 0.2-1.5 of manganese, 0.1-2 of nickel, 0-4
     each of molybdenum and tungsten, 1-4 of chromium, 0-0.2 of boron, 0-1 of
     niobium , 0-1 of vanadium, 0-1 of titanium, and iron being balance and
     impurities.  The piercer plug further comprises a tip section and a body
     section made of the same material; wherein the body section includes a
     cylindrical unit which is a hole for attaching a bar and the tip section
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is harder than the cylindrical unit. The manufg. method of piercer plug comprises a protective film forming on the surface of the piercer plug to the heating, wherein the protective film is a thermal sprayed coating and a buildup layer. According to the present invention, it is possible to provide a highly recyclable piercer plug.

IT 2315454-12-5P
RL: IMP (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(piercer plug made of seamless steel, and its manufg. method)

RN 2315454-12-5 CAPLUS

CN Iron alloy, base, Fe 82-97,Cr 1-4,Mo 0-4,W 0-4,Ni 0.1-2,Mn 0.2-1.5,Si 0.4-1.2,Nb 0-1,Ti 0-1,V 0-1,C 0.2-0.3,B 0-0.2 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	82 - 97	7439-89-6
Cr	1 - 4	7440-47-3
Mo	0 - 4	7439-98-7
W	0 - 4	7440-33-7
Ni	0.1 - 2	7440-02-0
Mn	0.2 - 1.5	7439-96-5
Si	0.4 - 1.2	7440-21-3
Nb	0 - 1	7440-03-1
Ti	0 - 1	7440-32-6
V	0 - 1	7440-62-2
C	0.2 - 0.3	7440-44-0
B	0 - 0.2	7440-42-8

IPCI C22C0038-00 [I]; C21D0009-00 [I]; C22C0038-54 [I]
IPCR C22C0038-00 [I]; C21D0009-00 [I]; C22C0038-54 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST carbon boron seamless steel piercer plug
IT 2315454-12-5P
RL: IMP (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(piercer plug made of seamless steel, and its manufg. method)

L15 ANSWER 21 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:807393 CAPLUS Full-text
DOCUMENT NUMBER: 170:538936
TITLE: Manufacture of steel components having a metal coating protecting it against corrosion
INVENTOR(S): Banik, Janko; Koeyer, Maria; Rosenstock, Dirk; Ruthenberg, Manuela
PATENT ASSIGNEE(S): Thyssenkrupp Steel Europe AG, Germany; Thyssenkrupp AG
SOURCE: PCT Int. Appl., 26pp.; Chemical Indexing Equivalent to 170:538935 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2019076720	A1	20190425	WO 2018-EP77692	20181011
DE 102017218704	A1	20190425	DE 2017-102017218704	20171019
CN 110997951	A	20200410	CN 2018-80049166	20181011
CN 110997951	B	20210824		
EP 3697936	A1	20200826	EP 2018-804228	20181011
US 20200216925	A1	20200709	US 2020-16647894	20200317
PRIORITY APPLN. INFO.:			DE 2017-102017218704 A	20171019
			WO 2018-EP77692 W	20181011

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2019076720	A1	Alive	20201219
DE 102017218704	A1	Alive	20201120
CN 110997951	A	Alive	20201121
CN 110997951	B	Alive	20210902
EP 3697936	A1	Alive	20201202

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     US 20200216925       A1   Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   A method for producing a steel component comprising a steel substrate
     and an aluminum alloy-based anti-corrosion coating, is described for use
     in the automotive sector.
RETABLE
   Referenced Author    |Year | VOL | PG   | Referenced Work     | Referenced
         (RAU)          |(RPY)|(RVL)|(RPG) |      (RWK)          | File
========================+=====+=====+======+=====================+===========
BANIK JANKO             |2016 |     |      |EP 2993248 A1        |CAPLUS
COBO SEBASTIAN          |2017 |     |      |US 20170253941 A1    |
KUSUMI K                |2007 |     |      |EP 1767286 A1        |CAPLUS
MAKI JUN                |2014 |     |      |EP 2695963 A1        |CAPLUS
ROSENSTOCK DIRK         |2018 |     |      |WO 2018234102 A1     |CAPLUS
IT   2307271-66-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; manuf. of steel components having a metal
        coating protecting it against corrosion)
RN   2307271-66-3  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.1-0.5,Si 0.1-0.5,Ti
     0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     94    -  99        7439-89-6
    Mn      0.5 -   3         7439-96-5
    Cr      0   -   1         7440-47-3
    C       0.1 -   0.5       7440-44-0
    Si      0.1 -   0.5       7440-21-3
    Ti      0   -   0.2       7440-32-6
    Al      0   -   0.1       7429-90-5
    B       0   -   0.1       7440-42-8
    Nb      0   -   0.1       7440-03-1
    P       0   -   0.1       7723-14-0

IPCI C21D0001-76 [I]; B21D0022-02 [I]; B21D0022-20 [I]; C21D0007-13 [I];
     C23C0002-12 [I]; C23C0002-26 [I]; C23C0002-28 [I]; C21D0009-46 [I];
     C21D0009-48 [I]; C21D0001-673 [I]
IPCR C21D0001-76 [I]; B21D0022-02 [I]; B21D0022-20 [I]; C21D0001-673 [I];
     C21D0007-13 [I]; C21D0009-46 [I]; C21D0009-48 [I]; C23C0002-12 [I];
     C23C0002-26 [I]; C23C0002-28 [I]
CC   55-10 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   steel metal prevention corrosion coating
IT   Automobile bodies
        (chassis; manuf. of steel components having a metal
        coating protecting it against corrosion)
IT   Anticorrosive coating materials
     Automobile bodies
     Automotive bumpers
        (manuf. of steel components having a metal coating
        protecting it against corrosion)
IT   1273096-81-3P, Aluminum alloy   2307271-67-4P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (anti-corrosion coatings; manuf. of steel
        components having a metal coating protecting it against
        corrosion)
IT   1333-74-0, Hydrogen, uses
     RL: MOA (Modifier or additive use); USES (Uses)
        (in steel; manuf. of steel components having a
        metal coating protecting it against corrosion)
IT   12597-69-2P, Steel, preparation   2307271-66-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; manuf. of steel components having a metal
        coating protecting it against corrosion)

L15  ANSWER 22 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
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ACCESSION NUMBER: 2019:805627 CAPLUS Full-text
DOCUMENT NUMBER: 170:527030
TITLE: Enamelling of high-strength steels
INVENTOR(S): Myslowicki, Stefan
PATENT ASSIGNEE(S): ThyssenKrupp Steel Europe AG, Germany; ThyssenKrupp AG
SOURCE: PCT Int. Appl., 28pp.; Chemical Indexing Equivalent to 170:527029 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2019076717	A1	20190425	WO 2018-EP77686	20181011
DE 102017218434	A1	20190418	DE 2017-102017218434	20171016
EP 3697545	A1	20200826	EP 2018-786281	20181011
PRIORITY APPLN. INFO.:			DE 2017-102017218434 A	20171016
			WO 2018-EP77686 W	20181011

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2019076717	A1	Alive	20201219
DE 102017218434	A1	Dead	20210715
EP 3697545	A1	Dead	20210820

AB A shaped part having at least two layers, comprises at least one layer made of high-strength steel with a tensile strength ≥500 MPa and a hardness ≥160 HV, and at least one layer made of a steel that has an enamel layer on the outer side. The shaped part are suitable for producing pipelines, pressure vessels, reactors or in app. engineering, in particular for the transport of aq. and/or corrosive media.

IT 2306234-82-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enamelling of high-strength steels)

RN 2306234-82-0 CAPLUS
CN Iron alloy, base, Fe 85-99,Mn 0.5-3,Al 0-3,Si 0.1-2.5,P 0-1.5,Cr 0-1,Mo 0-1,V 0-1,Ti 0-0.8,Nb 0-0.5,C 0-0.4,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	85 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Al	0 - 3	7429-90-5
Si	0.1 - 2.5	7440-21-3
P	0 - 1.5	7723-14-0
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
Ti	0 - 0.8	7440-32-6
Nb	0 - 0.5	7440-03-1
C	0 - 0.4	7440-44-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B21B0001-38 [I]; C21D0008-02 [I]; C21D0009-46 [I]; C22C0038-02 [I]; C23D0005-00 [I]
IPCR B21B0001-38 [I]; C21D0008-02 [I]; C21D0009-46 [I]; C22C0038-02 [I]; C23D0005-00 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST enamel strength steel bilayer
IT Enameling
Enamels (vitreous)
Pipelines
Pressure vessels
Reactors
(enamelling of high-strength steels)
IT 2306234-83-1P, preparation
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(enameled; enamelling of high-strength steels)
IT 12597-69-2P, Steel, preparation 59816-66-9P, preparation
2306234-82-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(enamelling of high-strength steels)

L15 ANSWER 23 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2019:802752 CAPLUS Full-text
DOCUMENT NUMBER: 170:538935
TITLE: Manufacture of steel components having a metal coating protecting it against corrosion
INVENTOR(S): Banik, Janko; Koeyer, Maria; Rosenstock, Dirk; Ruthenberg, Manuela
PATENT ASSIGNEE(S): Thyssenkrupp AG, Germany; Thyssenkrupp Steel Europe AG
SOURCE: Ger. Offen., 17pp.; Chemical Indexing Equivalent to 170:538936 (WO)
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102017218704	A1	20190425	DE 2017-102017218704	20171019
WO 2019076720	A1	20190425	WO 2018-EP77692	20181011
CN 110997951	A	20200410	CN 2018-80049166	20181011
CN 110997951	B	20210824		
EP 3697936	A1	20200826	EP 2018-804228	20181011
US 20200216925	A1	20200709	US 2020-16647894	20200317

PRIORITY APPLN. INFO.: DE 2017-102017218704 A 20171019
WO 2018-EP77692 W 20181011
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102017218704	A1	Alive	20201120
WO 2019076720	A1	Alive	20201219
CN 110997951	A	Alive	20201121
CN 110997951	B	Alive	20210902
EP 3697936	A1	Alive	20201202
US 20200216925	A1	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB A method for producing a steel component comprising a steel substrate and an aluminum alloy-based anti-corrosion coating, is described for use in the automotive sector.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				EP 1767286 A1	CAPLUS
Anon				US 20120085467 A1	CAPLUS
Anon				EP 2377965 A2	CAPLUS
Anon				EP 2993248 A1	CAPLUS

IT 2307271-66-3P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(strips; manuf. of steel components having a metal coating protecting it against corrosion)
RN 2307271-66-3 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.1-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.1 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6

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    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    Nb      0   -   0.1      7440-03-1
    P       0   -   0.1      7723-14-0

IPCI C22C0038-04 [I]; C23C0002-12 [I]; C23C0002-26 [I]; C21D0001-673 [I]
IPCR C22C0038-04 [I]; C21D0001-673 [I]; C23C0002-12 [I]; C23C0002-26 [I]
CC   55-10 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   steel metal prevention corrosion coating
IT   Automobile bodies
        (chassis; manuf. of steel components having a metal
        coating protecting it against corrosion)
IT   Anticorrosive coating materials
     Automobile bodies
     Automotive bumpers
        (manuf. of steel components having a metal coating
        protecting it against corrosion)
IT   1273096-81-3P, Aluminum alloy   2307271-67-4P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (anti-corrosion coatings; manuf. of steel
        components having a metal coating protecting it against
        corrosion)
IT   1333-74-0, Hydrogen, uses
     RL: MOA (Modifier or additive use); USES (Uses)
        (in steel; manuf. of steel components having a
        metal coating protecting it against corrosion)
IT   12597-69-2P, Steel, preparation   2307271-66-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; manuf. of steel components having a metal
        coating protecting it against corrosion)


L15  ANSWER 24 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2019:746016  CAPLUS Full-text
DOCUMENT NUMBER:          170:527029
TITLE:                    Enamelling of high-strength steels
INVENTOR(S):              Myslowicki, Stefan
PATENT ASSIGNEE(S):       ThyssenKrupp AG, Germany; ThyssenKrupp Steel Europe AG
SOURCE:                   Ger. Offen., 20pp.; Chemical Indexing Equivalent to
                          170:527030 (WO)
                          CODEN: GWXXBX
DOCUMENT TYPE:            Patent
LANGUAGE:                 German
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     DE 102017218434       A1   20190418    DE 2017-102017218434     20171016
     WO 2019076717         A1   20190425    WO 2018-EP77686          20181011
     EP 3697545            A1   20200826    EP 2018-786281           20181011
PRIORITY APPLN. INFO.:                      DE 2017-102017218434 A   20171016
                                            WO 2018-EP77686      W   20181011
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     DE 102017218434       A1   Dead            20210715
     WO 2019076717         A1   Alive           20201219
     EP 3697545            A1   Dead            20210820
AB   A shaped part having at least two layers, comprises at least one layer
     made of high-strength steel with a tensile strength ≥500 MPa and
     a hardness ≥160 HV, and at least one layer made of a steel that
     has an enamel layer on the outer side.  The shaped part are suitable for
     producing pipelines, pressure vessels, reactors or in app. engineering, in
     particular for the transport of aq. and/or corrosive media.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+==========
Anon                   |     |     |      |DE 102008022709 A1  |CAPLUS
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Anon                    |     |     |      |DE 1533303 C2       |
Anon                    |     |     |      |EP 2227574 B1       |CAPLUS
IT   2306234-82-0P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (enamelling of high-strength steels)
RN   2306234-82-0  CAPLUS
CN   Iron alloy, base, Fe 85-99,Mn 0.5-3,Al 0-3,Si 0.1-2.5,P 0-1.5,Cr 0-1,Mo
     0-1,V 0-1,Ti 0-0.8,Nb 0-0.5,C 0-0.4,B 0-0.1,S 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      85   -  99        7439-89-6
    Mn       0.5 -   3        7439-96-5
    Al       0   -   3        7429-90-5
    Si       0.1 -   2.5      7440-21-3
    P        0   -   1.5      7723-14-0
    Cr       0   -   1        7440-47-3
    Mo       0   -   1        7439-98-7
    V        0   -   1        7440-62-2
    Ti       0   -   0.8      7440-32-6
    Nb       0   -   0.5      7440-03-1
    C        0   -   0.4      7440-44-0
    B        0   -   0.1      7440-42-8
    S        0   -   0.1      7704-34-9

IPCI C23D0005-00 [I]; B23K0020-04 [I]
IPCR C23D0005-00 [I]; B23K0020-04 [I]
CC   55-6 (Ferrous Metals and Alloys)
     Section cross-reference(s): 57
ST   enamel strength steel bilayer
IT   Enameling
     Enamels (vitreous)
     Pipelines
     Pressure vessels
     Reactors
        (enamelling of high-strength steels)
IT   2306234-83-1P, preparation
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (enameled; enamelling of high-strength steels)
IT   12597-69-2P, Steel, preparation   59816-66-9P, preparation
     2306234-82-0P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (enamelling of high-strength steels)


L15  ANSWER 25 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2019:570060  CAPLUS Full-text
DOCUMENT NUMBER:          170:493791
TITLE:                    Method for manufacturing hot stamped parts with
                          aluminum-silicon alloy coating and hot stamped parts
INVENTOR(S):              Tan, Ning; Fu, Jiang; Hong, Jiyao; Fang, Xuehua
PATENT ASSIGNEE(S):       Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE:                   Faming Zhuanli Shenqing, 13pp.
                          CODEN: CNXXEV
DOCUMENT TYPE:            Patent
LANGUAGE:                 Chinese
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     CN 109518114          A    20190326    CN 2018-11035118         20180906
     WO 2020030200         A1   20200213    WO 2019-CN104708         20190906
     EP 3770295            A1   20210127    EP 2019-847997           20190906
     US 20210252579        A1   20210819    US 2020-17049547         20201021
PRIORITY APPLN. INFO.:                      CN 2018-10896744     A   20180808
                                            CN 2018-11035118     A   20180906
                                            WO 2019-CN104708     W   20190906
PATENT STATUS PATENT INFORMATION:
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PATENT NO.	KIND	STATUS	STATUS DATE
CN 109518114	A	Alive	20201121
WO 2020030200	A1	Alive	20201219
EP 3770295	A1	Alive	20210128
US 20210252579	A1	Alive	20210826

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The title method comprises the following steps of: processing steel plate coated with aluminum-silicon alloy coating to form a blank of a desired shape of the part, heat treating the blank, and hot stamping. The blank heat treatment adopts two-stage or three-stage heating and heat preservation, and the heating and heat preservation are stepwise heating. The steel plate coated with aluminum-silicon alloy coating include a substrate and an aluminum-silicon alloy coating on at least one surface thereof. The method fully considers the characteristics of the aluminum-silicon coating, is able to effectively solve the problem of roll banding of the aluminum-silicon coating, reduces the nodulation probability of the roller of the heat treatment furnace, improves the service life of the roller, and ensures the integrity of the coating of the hot stamped part as well as the mech. property, welding property, coating property and corrosion resisting property of the part.

IT 2305367-85-3P, Aluminum 0-0.3, boron 0-0.1, carbon 0.04-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1.2, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(method for manufg. hot stamped parts with aluminum-silicon alloy coating and hot stamped parts)

RN 2305367-85-3 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1.2,C 0-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1.2	7440-21-3
C	0 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI C23C0002-12; C23C0002-40; C22C0038-02; C22C0038-04; C22C0038-06; C22C0038-28; C22C0038-32; C22C0038-38; C21D0001-26; C21D0008-00; B21D0022-02

IPCR C23C0002-12 [I]; B21D0022-02 [I]; C21D0001-26 [I]; C21D0008-00 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-28 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C23C0002-40 [I]

CC 56-11 (Nonferrous Metals and Alloys)

ST hot stamping steel aluminum silicon coating

IT Cooling
Heat treatment
(method for manufg. hot stamped parts with aluminum-silicon alloy coating and hot stamped parts)

IT Metalworking
(stamping; method for manufg. hot stamped parts with aluminum-silicon alloy coating and hot stamped parts)

IT 2305367-85-3P, Aluminum 0-0.3, boron 0-0.1, carbon 0.04-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1.2, sulfur 0-0.1, titanium 0-0.5, iron bal. 2305367-88-6P, Iron 0-4, silicon 4-14, aluminum bal.
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(method for manufg. hot stamped parts with aluminum-silicon alloy coating and hot stamped parts)

L15 ANSWER 26 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2019:340815 CAPLUS Full-text
DOCUMENT NUMBER: 170:379972
TITLE: Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance
INVENTOR(S): Bi, Wenzhen; Hong, Jiyao; Wang, Li
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 7pp.; Chemical Indexing Equivalent to 173:85818 (WO)
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 109365606	A	20190222	CN 2018-11453322	20181130
WO 2020108593	A1	20200604	WO 2019-CN121859	20191129
PRIORITY APPLN. INFO.:			CN 2018-11453322 A	20181130

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 109365606	A	Transitional	20210722
WO 2020108593	A1	Alive	20201203

AB The invention discloses a hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance, which improves the corrosion resistance of the steel plate or the steel strip and avoids cracking of the substrate. The above steel plate or steel strip includes the following components in percentage by wt.: C 0.1-0.8%, Si 0.05-2.0%, Mn 0.5-3.0%, P <0.1%, S <0.05%, Al <0.1%, N <0.01%, and balance of Fe and impurities, and also includes at least one of Cr 0.01-1.0%, Mo 0.01-1.0%, Ti <0.2%, Nb 0.01-0.08%, V 0.01-1.0%, and B 0.005-0.08%; the zinc-based coating includes the following components in percentage by wt.: Al 0.15%-6.5%, Mg 0.2-7%, RE <0.2%, Sr 0.002-0.2%, and balance of Zn and impurities, and the coating further includes at least one or more of Mn, Cr, Al, and Mg, and the total amt. thereof is more than 0.1%.

IT 2293976-55-1, Aluminum 0-0.1, boron 0.005-0.1, carbon 0.1-0.8, chromium 0.01-1, iron bal., manganese 0.5-3, molybdenum 0.01-1, niobium 0.01-0.1, phosphorus 0-0.1, silicon 0.05-2, titanium 0-0.2, vanadium 0.01-1
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)
RN 2293976-55-1 CAPLUS
CN Iron alloy, base, Fe 91-99,Mn 0.5-3,Si 0-2,Cr 0-1,Mo 0-1,V 0-1,C 0.1-0.8,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	91 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3
Cr	0 - 1	7440-47-3
Mo	0 - 1	7439-98-7
V	0 - 1	7440-62-2
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0

IPCI B21D0022-02; C23C0002-06; C23C0002-40; C22C0018-00; C21D0008-02
IPCR B21D0022-02 [I]; C21D0008-02 [I]; C22C0018-00 [I]; C23C0002-06 [I]; C23C0002-40 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST corrosion resistance zinc alloy coating steel hot stamping
IT Anticorrosive coating materials
(Hot stamping method of zinc-based coated steel

plate or steel strip with excellent corrosion resistance)
IT Metalworking
(stamping, hot; Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)
IT 2293976-55-1, Aluminum 0-0.1, boron 0.005-0.1, carbon 0.1-0.8, chromium 0.01-1, iron bal., manganese 0.5-3, molybdenum 0.01-1, niobium 0.01-0.1, phosphorus 0-0.1, silicon 0.05-2, titanium 0-0.2, vanadium 0.01-1
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)
IT 2226545-76-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(Hot stamping method of zinc-based coated steel plate or steel strip with excellent corrosion resistance)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 27 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:2601319 CAPLUS Full-text
DOCUMENT NUMBER: 170:116258
TITLE: Method for producing a steel automotive component provided with an aluminum alloy anti-corrosion coating
INVENTOR(S): Rosenstock, Dirk; Banik, Janko
PATENT ASSIGNEE(S): ThyssenKrupp Steel Europe AG, Germany; ThyssenKrupp AG
SOURCE: PCT Int. Appl., 25pp.; Chemical Indexing Equivalent to 170:116256 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018234102	A1	20181227	WO 2018-EP65498	20180612
DE 102017210201	A1	20181220	DE 2017-102017210201	20170619
EP 3642371	A1	20200429	EP 2018-738199	20180612
PRIORITY APPLN. INFO.:			DE 2017-102017210201 A	20170619
			WO 2018-EP65498 W	20180612

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2018234102	A1	Alive	20201219
DE 102017210201	A1	Alive	20201121
EP 3642371	A1	Alive	20201202

AB A method is described for producing a corrosion-resistant steel automotive component comprising a substrate and an anticorrosive coating.
IT 2254829-63-3P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(strips; method for producing a steel automotive component provided with an aluminum alloy anti-corrosion coating)
RN 2254829-63-3 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1

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    P       0   -   0.1      7723-14-0

IPCI C21D0008-02 [I]; C23C0002-12 [I]; C21D0009-46 [I]; C21D0001-673 [I];
     B32B0015-01 [I]
IPCR C21D0008-02 [I]; B32B0015-01 [I]; C21D0001-673 [I]; C21D0009-46 [I];
     C23C0002-12 [I]
CC   55-10 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   steel automobile metal coating corrosion aluminum alloy
IT   Anticorrosive coating materials
        (metallic; method for producing a steel automotive component
        provided with an aluminum alloy anti-corrosion coating)
IT   Automobile bodies
     Automobile doors
     Automobile roofs
     Automotive bumpers
     Heat treatment
        (method for producing a steel automotive component provided
        with an aluminum alloy anti-corrosion coating)
IT   254455-65-7P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (coatings; method for producing a steel automotive
        component provided with an aluminum alloy anti-corrosion
        coating)
IT   870820-47-6P, 22MnB5   2254829-63-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; method for producing a steel automotive component
        provided with an aluminum alloy anti-corrosion coating)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 28 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2018:2544202  CAPLUS Full-text
DOCUMENT NUMBER:          170:116256
TITLE:                    Method for producing a steel automotive component
                          provided with an aluminum alloy anti-corrosion coating
INVENTOR(S):              Rosenstock, Dirk; Banik, Janko
PATENT ASSIGNEE(S):       ThyssenKrupp AG, Germany; ThyssenKrupp Steel Europe AG
SOURCE:                   Ger. Offen., 16pp.; Chemical Indexing Equivalent to
                          170:116258 (WO)
                          CODEN: GWXXBX
DOCUMENT TYPE:            Patent
LANGUAGE:                 German
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     DE 102017210201       A1   20181220    DE 2017-102017210201     20170619
     CN 109136775          A    20190104    CN 2017-10986828         20171020
     WO 2018234102         A1   20181227    WO 2018-EP65498          20180612
     EP 3642371            A1   20200429    EP 2018-738199           20180612
PRIORITY APPLN. INFO.:                      DE 2017-102017210201 A   20170619
                                            WO 2018-EP65498      W   20180612

PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
     DE 102017210201       A1   Alive           20201121
     CN 109136775          A    Alive           20201121
     WO 2018234102         A1   Alive           20201219
     EP 3642371            A1   Alive           20201202
AB   A method is described for producing a corrosion-resistant steel
     automotive component comprising a substrate and an anticorrosive coating.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+==========
Anon                   |     |     |      |DE 102007061489 A1  |CAPLUS
Anon                   |     |     |      |DE 102009007909 A1  |CAPLUS
Anon                   |     |     |      |WO 2015036151 A1    |CAPLUS
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Anon                    |     |     |      |WO 2016034476 A1    |CAPLUS
IT   2254629-63-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; method for producing a steel automotive component
        provided with an aluminum alloy anti-corrosion coating)
RN   2254829-63-3  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti
     0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      94   -  99        7439-89-6
    Mn       0.5 -   3        7439-96-5
    Cr       0   -   1        7440-47-3
    C        0.2 -   0.5      7440-44-0
    Si       0.1 -   0.5      7440-21-3
    Ti       0   -   0.2      7440-32-6
    Al       0   -   0.1      7429-90-5
    B        0   -   0.1      7440-42-8
    Nb       0   -   0.1      7440-03-1
    P        0   -   0.1      7723-14-0

IPCI C22C0038-04 [I]; C21D0008-02 [I]; C23C0002-12 [I]
IPCR C22C0038-04 [I]; C21D0008-02 [I]; C23C0002-12 [I]
CC   55-10 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   steel automobile metal coating corrosion aluminum alloy
IT   Anticorrosive coating materials
        (metallic; method for producing a steel automotive component
        provided with an aluminum alloy anti-corrosion coating)
IT   Automobile bodies
     Automobile doors
     Automobile roofs
     Automotive bumpers
     Heat treatment
        (method for producing a steel automotive component provided
        with an aluminum alloy anti-corrosion coating)
IT   254455-65-7P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (coatings; method for producing a steel automotive
        component provided with an aluminum alloy anti-corrosion
        coating)
IT   870820-47-6P, 22MnB5   2254829-63-3P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; method for producing a steel automotive component
        provided with an aluminum alloy anti-corrosion coating)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 29 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2018:2392166  CAPLUS Full-text
DOCUMENT NUMBER:         173:942851
TITLE:                   Corrosion behavior and surface analysis of 690
                         MPa-grade offshore steels in chloride media
AUTHOR(S):               Huang, Wei-Hsuan; Yen, Hung-Wei; Lee, Yueh-Lien
CORPORATE SOURCE:        Department of Engineering Science and Ocean
                         Engineering, 1 Roosevelt Road, National Taiwan
                         University, Taipei, 106, Taiwan
SOURCE:                  Journal of Materials Research and Technology (2019),
                         8(1), 1476-1485
                         CODEN: JMRTAL; ISSN: 2238-7854
DIGITAL OBJECT ID:       10.1016/j.jmrt.2018.11.002
PUBLISHER:               Elsevier B.V.
DOCUMENT TYPE:           Journal; (online computer file)
LANGUAGE:                English
AB   High-strength low-alloy steels have been used prevalently in marine
     engineering and the defense industry because of their superior yield
```

strength, toughness, and weldability. Although these materials have excellent mech. properties, the corrosion resistance of high-strength low-alloy steels is a crucial problem, particularly when they are used in a marine environment. In this study, the corrosion behavior of a newly designed NiCu-contg. low-carbon steel (NiCu steel) and conventional S690Q alloy steel (S690Q steel) was investigated and compared. Potentiodynamic polarization results indicated that for NiCu steel, current densities are apparently reduced in the anodic region. Surface analyses indicated that NiCu steel created a thick and uniform inner rust layer after it was immersed in NaCl soln. for 7 days. Furthermore, a high-d. Cr-rich region was obsd. in the NiCu inner rust layer after an immersion test. Electrochem. impedance spectroscopy results suggested that NiCu steel exhibits higher corrosion resistance than S690Q steel in NaCl soln.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Antunes, R	2003	6	403	Mater Res	CAPLUS
Cano, H	2014	87	438	Corros Sci	CAPLUS
Chen, A	2012	19	59	J Iron Steel Res Int	CAPLUS
Diaz, I	2013	76	348	Corros Sci	CAPLUS
Hao, L	2012	58	175	Corros Sci	CAPLUS
Hao, L	2012	54	244	Corros Sci	CAPLUS
Hao, W	2018	710	318	Mater Sci Eng A	CAPLUS
Hassan, H	2007	52	6359	Electrochim Acta	CAPLUS
Hiller, J	1966	17	943	Mater Corros	CAPLUS
Hong, J	2012	54	174	Corros Sci	CAPLUS
Kato, C	1984	24	591	Corros Sci	CAPLUS
Keller, P	1967	18	865	Mater Corros	CAPLUS
Kissi, M	2006	252	4190	Appl Surf Sci	CAPLUS
Li, J	2017	42	22175	Int J Hydrogen Energ	CAPLUS
Lopez, D	2003	48	845	Electrochim Acta	CAPLUS
Ma, Y	2009	51	997	Corros Sci	CAPLUS
Misawa, T	1974	14	131	Corros Sci	CAPLUS
Misawa, T	1974	14	279	Corros Sci	CAPLUS
Morcillo, M	2011	47	426	Rev Metal Madrid	CAPLUS
Mujahid, M	1998	7	247	J Mater Eng Perform	CAPLUS
Oh, S	1999	41	1687	Corros Sci	CAPLUS
Popova, A	2007	49	3290	Corros Sci	CAPLUS
Qiu, Y	2018	133	386	Corros Sci	CAPLUS
Shi, Y	2017	119	33	Corros Sci	CAPLUS
Singh, A	1985	25	931	Corros Sci	CAPLUS
Stratmann, M	1987	27	905	Corros Sci	CAPLUS
Ujiro, T	2001	43	2185	Corros Sci	CAPLUS
Wu, W	2015	24	4636	J Mater Eng Perform	CAPLUS
Xi, T	2017	71	1079	Mater Sci Eng C	CAPLUS
Yamashita, M	1994	36	283	Corros Sci	CAPLUS
Yang, Y	2010	52	2697	Corros Sci	CAPLUS
Yen, H	2017	7	253	Metals	CAPLUS
Zhang, Q	2002	77	603	Mater Chem Phys	
Zhou, Y	2013	29	168	Mater Sci Technol	CAPLUS

IT 186511-13-7
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(corrosion behavior and surface anal. of 690 MPa-grade offshore steels in chloride media)

RN 186511-13-7 CAPLUS

CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8931) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 100	7439-89-6
Mn	0 - 1.70	7439-96-5
Ni	0 - 1.50	7440-02-0
Cr	0 - 1.00	7440-47-3
Si	0.15 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
Cu	0 - 0.50	7440-50-8

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    C           0    -   0.20          7440-44-0
    V           0    -   0.12          7440-62-2
    Nb          0    -   0.05          7440-03-1
    P           0    -   0.025         7723-14-0
    S           0    -   0.025         7704-34-9
    B           0    -   0.005         7440-42-8

CC   55-10 (Ferrous Metals and Alloys)
ST   copper nickel steel corrosion resistance surface analysis sodium chloride
IT   Polarization
       (Potentiodynamic; corrosion behavior and surface anal. of 690 MPa-grade
       offshore steels in chloride media)
IT   Corrosion resistance
     Current density
     Surface analysis
       (corrosion behavior and surface anal. of 690 MPa-grade offshore
       steels in chloride media)
IT   7647-14-5, Sodium chloride (NaCl), uses
     RL: NUU (Other use, unclassified); USES (Uses)
       (corrosion behavior and surface anal. of 690 MPa-grade offshore
       steels in chloride media)
IT   7440-47-3, Chromium, processes
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
       (corrosion behavior and surface anal. of 690 MPa-grade offshore
       steels in chloride media)
IT   55354-05-7, properties   186511-13-7
     RL: PRP (Properties); TEM (Technical or engineered material use); USES
     (Uses)
       (corrosion behavior and surface anal. of 690 MPa-grade offshore
       steels in chloride media)
OS.CITING REF COUNT:     5     THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD
                               (5 CITINGS)


L15  ANSWER 30 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2018:2321302  CAPLUS Full-text
DOCUMENT NUMBER:          170:49880
TITLE:                    Steel-based electromagnetic shield multilayer screen
                          products
INVENTOR(S):              Wieschalla, Vanessa; Nierhoff, Daniel; Wolske,
                          Vanessa; Becker, Jens-Ulrik
PATENT ASSIGNEE(S):       ThyssenKrupp AG, Germany; ThyssenKrupp Steel Europe AG
SOURCE:                   Ger., 17pp.
                          CODEN: GWXXAW
DOCUMENT TYPE:            Patent
LANGUAGE:                 German
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     DE 102017216975       B3   20181129    DE 2017-102017216975     20170925
     WO 2019057547         A1   20190328    WO 2018-EP74424          20180911
PRIORITY APPLN. INFO.:                     DE 2017-102017216975 A   20170925
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS           STATUS DATE
     ---------------      ----  -------------    -----------
     DE 102017216975       B3   Alive            20201121
     WO 2019057547         A1   Alive            20201203
AB   An electromagnetic radiation shielding multilayer material is manufd. for
     shielding from electromagnetic radiation, static elec. and/or static
     magnetic fields.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work     | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)          | File
=======================+=====+=====+======+=====================+===========
Anon                   |     |     |      |EP 1426982 A1        |CAPLUS
Anon                   |     |     |      |WO 1991012960 A1     |
Anon                   |     |     |      |DE 3710322 A1        |CAPLUS
IT   2253656-70-9P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
       (layers; steel-based electromagnetic shield
```

multilayer screen products)
RN 2253656-70-9 CAPLUS
CN Iron alloy, base, Fe 94-100,Mn 0.1-3,C 0-0.5,Cr 0-0.5,Cu 0-0.5,Si 0-0.5,Ti 0-0.3,Ni 0-0.2,Al 0-0.1,As 0-0.1,B 0-0.1,Mo 0-0.1,N 0-0.1,Nb 0-0.1,P 0-0.1,S 0-0.1,Sn 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 100	7439-89-6
Mn	0.1 - 3	7439-96-5
C	0 - 0.5	7440-44-0
Cr	0 - 0.5	7440-47-3
Cu	0 - 0.5	7440-50-8
Si	0 - 0.5	7440-21-3
Ti	0 - 0.3	7440-32-6
Ni	0 - 0.2	7440-02-0
Al	0 - 0.1	7429-90-5
As	0 - 0.1	7440-38-2
B	0 - 0.1	7440-42-8
Mo	0 - 0.1	7439-98-7
N	0 - 0.1	17778-88-0
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
S	0 - 0.1	7704-34-9
Sn	0 - 0.1	7440-31-5
V	0 - 0.1	7440-62-2

IPCI C22C0038-02 [I]; H05K0009-00 [I]; C22C0038-04 [I]; C22C0038-18 [I]
IPCR C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-18 [I]; H05K0009-00 [I]
CC 55-3 (Ferrous Metals and Alloys)
Section cross-reference(s): 73, 76, 77
ST multilayer screen electromagnetic shield stainless steel alloy
IT Electromagnetic shields
Hot rolling
Multilayers
(steel-based electromagnetic shield multilayer screen products)
IT 2253656-70-9P 2253656-71-0P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(layers; steel-based electromagnetic shield multilayer screen products)

L15 ANSWER 31 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:1950769 CAPLUS Full-text
DOCUMENT NUMBER: 169:495369
TITLE: Microstructural features and corrosion analysis of A517 steel joint processed by friction stir welding
AUTHOR(S): Ansaripour, Morteza; Soltanipour, Abdol Reza; Dehnavi, Mohamad Reza
CORPORATE SOURCE: Materials Engineering Department, Malek Ashtar University of Technology, Shahin Shahr, Iran
SOURCE: Materials Research Express (2018), 5(6), 066543/1-066543/13
CODEN: MREAC3; ISSN: 2053-1591
DIGITAL OBJECT ID: 10.1088/2053-1591/aacc80
PUBLISHER: IOP Publishing Ltd.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Microstructural observations of friction stir welds of A517 (B) steel showed that within the range of welding variables, martensite phase was hindered. Stir zone microstructure displayed coarse-grained upper bainite assocd. with granular bainite. HAZ consisted of decompd. bainite morphol. of lath-like and equiaxed. Electron backscatter diffraction anal. showed a random oriented recrystd. grain. The corrosion behavior in 3.5 wt% NaCl soln. revealed neg. shift of corrosion potential with increasing of traverse speed. However, the effect of welding parameters on cathodic behavior was more predominant than that on anodic behavior; assocd. with the microstructural alterations. Pitting of corrosion rust layer was identified as the main mechanism of corrosion attack in base material and

welds. Although, corrosion c.d. of weld in all of the applied welding condition was slightly lower than that in the base material, however, this study provides recommendation for application of A517 steel jointed by friction stir welding in marine environment.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Bhadeshia, H	1999	A273-	58	Mater Sci Eng	CAPLUS
Casalino, G	2012		8239	Proc of SPIE-The Int	
Casalino, G	2014		8963	Proc of SPIE-The Int	
Chen, Y	2005	398	47	Mater Sci Eng A	
Choi, Y	2005	391	162	J Alloys Compd	CAPLUS
Cui, H	2016	681	426	J of Alloys and Comp	CAPLUS
Gao, K	2010	52	3428	Corros Sci	CAPLUS
Ghosh, M	2013	22	3890	J Mater Eng Perform	CAPLUS
Huang, H	1994	36	1027	Corros Sci	CAPLUS
Lee, W	2004	58	1041	Mater Lett	CAPLUS
Li, L	2012	7	3773	Int J Electrochem Sc	CAPLUS
Lu, B	2009	57	41	Acta Mater	CAPLUS
Manvatkar, V	2015	94	36	Scr Mater	CAPLUS
Medina, G	2016	21	146	Soldagem & Inspecao	CAPLUS
Meshram, S	2017	25	94	Journal of Manufactu	
Mishra, R	2005	50	1	Mater Sci Eng R	
Nelson, T	2016	231	66	Mater Process Techno	CAPLUS
Park, H	2004	371A	160	Mater Sci Eng	
Paul, C	2015	10	10246	Int J Electrochem Sc	
Ramirez, A	2013		75	Proc of the 1st Int	
Ren, R	2012	85	283	Electrochemica Acta	CAPLUS
Sato, Y	2005	53	637	Acta Mater	CAPLUS
Sato, Y	2001	32A	3033	Metall Mater Trans	CAPLUS
Sherif, E	2015	10	34	Int J Electrochem Sc	
Sherif, E	2011	129	961	Mater Chem Phy	CAPLUS
Sutton, M	2003	70	2215	Eng Fract Mech	
Sutton, M	2003	354A	6	Mater Sci Eng	
Wang, H	2015	10	5827	Int J Electrochem Sc	CAPLUS
Wang, X	2014	9	4574	Int J Electrochem Sc	
Wang, X	2014	21	474	J Nat Gas Sci Eng	CAPLUS
Wert, J	2003	49	607	Scr Mater	CAPLUS
Yan, J	2005	10	725	Sci Tech Weld Joinin	CAPLUS
Zajac, S	2005		387	Proc of the Int Conf	CAPLUS
Zhang, Q	2002	77	603	Mater Chem Phys	
Zhang, R	2010	41A	1448	Metall Mater Trans	CAPLUS
Zhang, S	2013	75	293	Corros Sci	CAPLUS

IT 52346-86-8, A517B, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(microstructural features and corrosion anal. of A517 steel joint processed by friction stir welding)
RN 52346-86-8 CAPLUS
CN Steel, (UNS K11630) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.70	-	1.00	7439-96-5
Cr	0.40	-	0.65	7440-47-3
Si	0.20	-	0.35	7440-21-3
Mo	0.15	-	0.25	7439-98-7
C	0.12	-	0.21	7440-44-0
V	0.03	-	0.08	7440-62-2
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
Ti	0.01	-	0.03	7440-32-6
B	0.0005	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST steel joint processed friction stir welding microstructural feature corrosion
IT Corrosion
Corrosion resistance

Current density
Electric current-potential relationship
Friction welding
Friction welds
Grain size
Microstructure
Recrystallization
(microstructural features and corrosion anal. of A517 steel joint processed by friction stir welding)

IT 12173-93-2, Martensite, formation (nonpreparative) 12427-23-5, Bainite
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(microstructural features and corrosion anal. of A517 steel joint processed by friction stir welding)

IT 52346-86-0, A517B, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(microstructural features and corrosion anal. of A517 steel joint processed by friction stir welding)

L15 ANSWER 32 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:1916470 CAPLUS Full-text
DOCUMENT NUMBER: 169:454845
TITLE: Aluminum alloy plated electric resistance welded pipe for quenching and method of manufacturing aluminum plated hollow member
INVENTOR(S): Maki, Jun; Fujita, Soshi; Nakamura, Toyomitsu
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: Jpn. Tokkyo Koho, 23pp.
CODEN: JTXXFF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 6406475	B1	20181017	JP 2018-513042	20171120
WO 2019097729	A1	20190523	WO 2017-JP41697	20171120
CN 111247266	A	20200605	CN 2017-80096110	20171120
IN 202017014250	A	20200814	IN 2020-17014250	20200331
US 20200347489	A1	20201105	US 2020-16753961	20200406

PRIORITY APPLN. INFO.: WO 2017-JP41697 W 20171120
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
JP 6406475	B1	Alive	20201121
WO 2019097729	A1	Dead	20210722
CN 111247266	A	Alive	20201120
US 20200347489	A1	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The aluminum alloy plated elec. resistance welded pipe for quenching comprises a base material made of tubular steel plate and an elec. resistance welded part provided in abutting part of steel plate and extending in longitudinal direction. The base material comprises in mass%: carbon 0.06-0.5, silicon 0.01-0.8, manganese 0.6-3, phosphorous 0-0.05, sulfur 0-0.05, aluminum 0-0.1, oxygen 0-0.006, nitrogen 0-0.02, titanium 0.01-0.1, boron 0-0.1, niobium 0-0.1, vanadium 0-0.3, chromium 0-0.5, molybdenum 0-0.5, nickel 0-0.5, copper 0-0.5, calcium 0-0.005, rare earth metal 0-0.005, iron balance and impurities. The base material is positioned on the surface of steel sheet and has an intermetallic compd. layer contg. an aluminum-iron-silicon based intermetallic compd. and an aluminum plating layer located on the surface of the intermetallic compd. layer and contg. aluminum and silicon. The thickness of intermetallic compd. layer is X (μm), the thickness of aluminum layer is Y (μm), and when the thickness of steel pipe is t (mm) and outer diam. of steel pipe is D (mm), the following formula is satisfied: $70 \times X/D \leq Y/t \leq 30$. The method of manufg. aluminum plated hollow member comprises: positioning the base material on the surface of steel sheet, heating aluminum-plated elec. resistance welded pipe, forming the heated aluminum-plated elec. resistance welded pipe into desired shape, and rapidly cooling the aluminum plating elec. resistance welded pipe. According to the present invention, it is possible to manuf.

high strength aluminum plated hollow member by hot working, and it is possible to obtain part that has reduced wt.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1983			JP 58204179 A	CAPLUS
Anon	2008			JP 2008069398 A	CAPLUS
Anon	2009			WO 2009131233 A1	CAPLUS
Anon	2014			JP 2014118628 A	CAPLUS
Anon	2017			JP 2017026147 A	CAPLUS

IT 2247299-93-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum alloy plated elec. resistance welded pipe for quenching and method of manufg. aluminum plated hollow member)

RN 2247299-93-8 CAPLUS

CN Iron alloy, base, Fe 93-99,Mn 0.6-3,Si 0-0.8,C 0.1-0.5,Cr 0-0.5,Cu 0-0.5,Mo 0-0.5,Ni 0-0.5,V 0-0.3,Al 0-0.1,B 0-0.1,Nb 0-0.1,Ti 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.6 - 3	7439-96-5
Si	0 - 0.8	7440-21-3
C	0.1 - 0.5	7440-44-0
Cr	0 - 0.5	7440-47-3
Cu	0 - 0.5	7440-50-8
Mo	0 - 0.5	7439-98-7
Ni	0 - 0.5	7440-02-0
V	0 - 0.3	7440-62-2
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
Ti	0 - 0.1	7440-32-6

IPCI C23C0002-28 [I]; C23C0002-12 [I]; C23C0002-40 [I]; C23C0002-26 [I]; C23C0028-00 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C21D0009-08 [N]; C21D0001-18 [N]; C21D0009-50 [N]; C22C0021-00 [N]
IPCR C23C0002-28 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C23C0002-12 [I]; C23C0002-26 [I]; C23C0002-40 [I]; C23C0028-00 [I]
CC 56-6 (Nonferrous Metals and Alloys)
IT 2247299-93-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum alloy plated elec. resistance welded pipe for quenching and method of manufg. aluminum plated hollow member)

L15 ANSWER 33 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:1651585 CAPLUS Full-text
DOCUMENT NUMBER: 169:330484
TITLE: Method for producing a hot-formed coated steel product
INVENTOR(S): Beentjes, Petrus Cornelis Jozef; Van Schoonevelt, Hugo
PATENT ASSIGNEE(S): Tata Steel IJmuiden B.V., Neth.
SOURCE: PCT Int. Appl., 28pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018158166	A1	20180907	WO 2018-EP54600	20180223
CA 3051002	A1	20180907	CA 2018-3051002	20180223
MX 2019010192	A	20191002	MX 2019-10192	20180223
CN 110352260	A	20191018	CN 2018-80014405	20180223
KR 2019124211	A	20191104	KR 2019-7023413	20180223
EP 3589772	A1	20200108	EP 2018-714700	20180223
JP 2020510755	T	20200409	JP 2019-546825	20180223

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     BR 112019015673      A2   20200707    BR 2019-112019015673    20180223
     US 20200165712       A1   20200528    US 2019-16485606        20190813
     IN 201947037974      A    20190927    IN 2019-47037974        20190920
PRIORITY APPLN. INFO.:                      EP 2017-158418       A  20170228
                                            EP 2017-158419       A  20170228
                                            WO 2018-EP54600      W  20180223
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     --------------       ----  -------------   -----------
     WO 2018158166         A1   Alive           20201219
     CA 3051002            A1   Alive           20201121
     MX 2019010192         A    Alive           20201121
     CN 110352260          A    Alive           20201121
     KR 2019124211         A    Alive           20201121
     EP 3589772            A1   Alive           20201202
     BR 112019015673       A2   Alive           20201209
     US 20200165712        A1   Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The invention relates to an Al-Si-alloy coated steel strip for hot
     press forming and to a method for producing the Al-Si-alloy coated
     steel strip in a continuous coating process.
IT   2243499-83-2D, Aluminum 0-3, boron 0-0.1, carbon 0-0.5, chromium
     0-4, copper 0-2, manganese 0.4-4, molybdenum 0-1, nickel 0-2, niobium
     0-0.3, phosphorus 0-0.1, silicon 0-3, titanium 0-0.3, tungsten 0-0.5,
     vanadium 0-0.5, iron bal., S 0-0.05, N 0.001-0.03, Ca 0-0.05, O 0-0.008
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (method for producing hot-formed coated steel
        product)
RN   2243499-83-2  CAPLUS
CN   Iron alloy, base, Fe 79-100,Mn 0.4-4,Cr 0-4,Al 0-3,Si 0-3,Cu 0-2,Ni 0-2,Mo
     0-1,C 0-0.5,V 0-0.5,W 0-0.5,Nb 0-0.3,Ti 0-0.3,B 0-0.1,P 0-0.1  (CA INDEX
     NAME)

Component   Component      Component
              Percent    Registry Number
=========+=============+===============
    Fe     79   - 100        7439-89-6
    Mn      0.4 -   4        7439-96-5
    Cr      0   -   4        7440-47-3
    Al      0   -   3        7429-90-5
    Si      0   -   3        7440-21-3
    Cu      0   -   2        7440-50-8
    Ni      0   -   2        7440-02-0
    Mo      0   -   1        7439-98-7
    C       0   -   0.5      7440-44-0
    V       0   -   0.5      7440-62-2
    W       0   -   0.5      7440-33-7
    Nb      0   -   0.3      7440-03-1
    Ti      0   -   0.3      7440-32-6
    B       0   -   0.1      7440-42-8
    P       0   -   0.1      7723-14-0

IPCI C23C0002-12 [I]; C23C0002-28 [I]; C23C0002-40 [I]
IPCR C23C0002-12 [I]; C23C0002-28 [I]; C23C0002-40 [I]
CC   56-7 (Nonferrous Metals and Alloys)
ST   hot formed aluminum silicon alloy coated steel product prodn
IT   Paints
        (adhesion; method for producing hot-formed coated
        steel product)
IT   Heating
        (convective, prediffusion annealing; method for producing hot-formed
        coated steel product)
IT   Aluminizing
        (hot dip; method for producing hot-formed coated
        steel product)
IT   Hot-dip coating process
        (hot-dip aluminizing; method for producing hot-formed coated
        steel product)
IT   Metal forming
        (hot; method for producing hot-formed coated steel
        product)
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IT Automobile bodies
Cooling
Cutting
Diffusion coating materials
Immersion coating process
Phase composition
Surface structure
Thickness
(method for producing hot-formed coated steel product)
IT Adhesion, physical
(paint; method for producing hot-formed coated steel product)
IT Induction heating
Radiant heating
(prediffusion annealing; method for producing hot-formed coated steel product)
IT Annealing
(prediffusion; method for producing hot-formed coated steel product)
IT 12004-62-5 12043-58-2 596799-27-8, Aluminum iron silicide (Al2Fe2Si)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(method for producing hot-formed coated steel product)
IT 7440-70-2D, Calcium, trace in steel 7704-34-9D, Sulfur, trace in steel 7727-37-9D, Nitrogen, trace in steel
7782-44-7D, Oxygen, trace in steel
RL: OCU (Occurrence, unclassified); OCCU (Occurrence)
(method for producing hot-formed coated steel product)
IT 2243499-83-2D, Aluminum 0-3, boron 0-0.1, carbon 0-0.5, chromium 0-4, copper 0-2, manganese 0.4-4, molybdenum 0-1, nickel 0-2, niobium 0-0.3, phosphorus 0-0.1, silicon 0-3, titanium 0-0.3, tungsten 0-0.5, vanadium 0-0.5, iron bal., S 0-0.05, N 0.001-0.03, Ca 0-0.05, O 0-0.008
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for producing hot-formed coated steel product)
IT 12597-69-2, Steel, processes 2243499-81-0, Aluminum 96-100, silicon 0.4-4
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for producing hot-formed coated steel product)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 34 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:1651584 CAPLUS Full-text
DOCUMENT NUMBER: 169:330483
TITLE: Method for producing a steel strip with an aluminum alloy coating layer
INVENTOR(S): Hensen, Guido Cornelis
PATENT ASSIGNEE(S): Tata Steel IJmuiden B.V., Neth.
SOURCE: PCT Int. Appl., 29pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018158165	A1	20180907	WO 2018-EP54599	20180223
CA 3051515	A1	20180907	CA 2018-3051515	20180223
CN 110352259	A	20191018	CN 2018-80014404	20180223
KR 2019124210	A	20191104	KR 2019-7023412	20180223
EP 3589771	A1	20200108	EP 2018-714699	20180223
BR 112019015695	A2	20200407	BR 2019-112019015695	20180223
JP 2020510756	T	20200409	JP 2019-546864	20180223
US 20200017948	A1	20200116	US 2019-16485655	20190813
IN 201947038244	A	20191004	IN 2019-47038244	20190923

PRIORITY APPLN. INFO.:

EP 2017-158418	A	20170228
EP 2017-158419	A	20170228
WO 2018-EP54599	W	20180223

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2018158165	A1	Alive	20201219
CA 3051515	A1	Alive	20201121
CN 110352259	A	Alive	20201120
KR 2019124210	A	Alive	20201121
EP 3589771	A1	Alive	20201202
BR 112019015695	A2	Alive	20201209
US 20200017948	A1	Alive	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention relates to a method for producing a steel strip with an aluminum alloy coating layer in a continuous coating process. The invention also relates to an steel strip coated with an aluminum alloy coating layer that can be produced in accordance with the method, the use of such a coated steel strip and the product made by using the coated steel strip.

IT 2243499-83-2D, Aluminum 0-3, boron 0-0.1, carbon 0-0.5, chromium 0-4, copper 0-2, manganese 0.4-4, molybdenum 0-1, nickel 0-2, niobium 0-0.3, phosphorus 0-0.1, silicon 0-3, titanium 0-0.3, tungsten 0-0.5, vanadium 0-0.5, iron bal., S 0-0.05, N 0.001-0.03, Ca 0-0.05, O 0-0.008
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for producing steel strip with aluminum alloy coating layer)

RN 2243499-83-2 CAPLUS

CN Iron alloy, base, Fe 79-100,Mn 0.4-4,Cr 0-4,Al 0-3,Si 0-3,Cu 0-2,Ni 0-2,Mo 0-1,C 0-0.5,V 0-0.5,W 0-0.5,Nb 0-0.3,Ti 0-0.3,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	79 - 100	7439-89-6
Mn	0.4 - 4	7439-96-5
Cr	0 - 4	7440-47-3
Al	0 - 3	7429-90-5
Si	0 - 3	7440-21-3
Cu	0 - 2	7440-50-8
Ni	0 - 2	7440-02-0
Mo	0 - 1	7439-98-7
C	0 - 0.5	7440-44-0
V	0 - 0.5	7440-62-2
W	0 - 0.5	7440-33-7
Nb	0 - 0.3	7440-03-1
Ti	0 - 0.3	7440-32-6
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

IPCI C23C0002-12 [I]; C23C0002-28 [I]; C23C0002-40 [I]
IPCR C23C0002-12 [I]; C23C0002-28 [I]; C23C0002-40 [I]
CC 56-7 (Nonferrous Metals and Alloys)
ST aluminum alloy coated steel strip hot dip prodn method
IT Recrystallization
(annealing, before hot dipping; method for producing steel strip with aluminum alloy coating layer)
IT Induction heating
Radiant heating
(annealing; method for producing steel strip with aluminum alloy coating layer)
IT Annealing
(diffusion; method for producing steel strip with aluminum alloy coating layer)
IT Aluminizing
(hot dip, continuous; method for producing steel strip with aluminum alloy coating layer)
IT Hot-dip coating process
(hot-dip aluminizing, continuous; method for producing steel strip with aluminum alloy coating layer)

IT Metal forming
(hot; method for producing steel strip with aluminum alloy coating layer)
IT Automobile bodies
Cooling
Cutting
Diffusion coating materials
Electric heating
Phase composition
Temperature
Thickness
(method for producing steel strip with aluminum alloy coating layer)
IT Crack propagation
(resistance; method for producing steel strip with aluminum alloy coating layer)
IT Wetting
(time; method for producing steel strip with aluminum alloy coating layer)
IT 12004-62-5 12043-58-2 596799-27-8, Aluminum iron silicide (Al2Fe2Si)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(method for producing steel strip with aluminum alloy coating layer)
IT 7440-70-2D, Calcium, trace in steel 7704-34-9D, Sulfur, trace in steel 7727-37-9D, Nitrogen, trace in steel
7782-44-7D, Oxygen, trace in steel
RL: OCU (Occurrence, unclassified); OCCU (Occurrence)
(method for producing steel strip with aluminum alloy coating layer)
IT 12597-69-2, Steel, processes 2243499-81-0, Aluminum 96-100, silicon 0.4-4 2243499-83-2D, Aluminum 0-3, boron 0-0.1, carbon 0-0.5, chromium 0-4, copper 0-2, manganese 0.4-4, molybdenum 0-1, nickel 0-2, niobium 0-0.3, phosphorus 0-0.1, silicon 0-3, titanium 0-0.3, tungsten 0-0.5, vanadium 0-0.5, iron bal., S 0-0.05, N 0.001-0.03, Ca 0-0.05, O 0-0.008 2243499-84-3, Aluminum 97, iron 2.3, silicon 0.9
2243499-85-4, Aluminum 96, iron 2.3, silicon 1.9 2243499-86-5, Aluminum 96, iron 2.8, silicon 0.9
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for producing steel strip with aluminum alloy coating layer)
IT 2243499-82-1P, Aluminum 50-55, iron 43-48, silicon 0.4-4
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(method for producing steel strip with aluminum alloy coating layer)

L15 ANSWER 35 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:1600412 CAPLUS Full-text
DOCUMENT NUMBER: 169:319926
TITLE: Method for coating a component
INVENTOR(S): Sordelet, Daniel Joseph; Cavanaugh, Daniel Thomas
PATENT ASSIGNEE(S): Caterpillar Inc., USA
SOURCE: U.S. Pat. Appl. Publ., 14pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20180245638	A1	20180830	US 2017-15444415	20170228

PRIORITY APPLN. INFO.: US 2017-15444415 20170228
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
US 20180245638	A1	Dead	20201220

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB A method for coating a component, the method including the steps of depositing, by a thermal spraying process, simultaneously a first material and a second material on a surface of the component to form a rough

coating, wherein the first material is of higher hardness than the second material and removing a layer of the rough coating such that the second material plastically deforms and produces a finished coating having a finished surface with an Rz value of \<2 μm.

IT 916826-46-5, Tafa 140MXC
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for coating a component)

RN 916826-46-5 CAPLUS

CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 40	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 9	7440-03-1
W	0 - 9	7440-33-7
B	0 - 5	7440-42-8
Mn	0 - 5	7439-96-5
C	0 - 4	7440-44-0
Si	0 - 2	7440-21-3

IPCI F16C0033-14 [I]; C23C0004-06 [I]; C23C0004-134 [I]; C23C0004-126 [I]; C23C0004-131 [I]; C23C0004-129 [I]; C23C0004-18 [I]

IPCR F16C0033-14 [I]; C23C0004-06 [I]; C23C0004-126 [I]; C23C0004-129 [I]; C23C0004-131 [I]; C23C0004-134 [I]; C23C0004-18 [I]

CC 56-6 (Nonferrous Metals and Alloys)

ST metal thermal spraying coating hardness roughness

IT Coating materials
Surface roughness
Thermal spray coating process
Vickers hardness
(method for coating a component)

IT 1308-38-9, Chromium oxide (Cr2O3), processes 1314-23-4, Zirconium oxide (ZrO2), processes 1344-28-1, Alumina, processes 7429-90-5, Tafa 01T, processes 7440-02-0, Nickel, processes 7440-48-4, Cobalt, processes 7440-50-8, Copper, processes 7440-66-6, Tafa 02Z, processes 8049-28-3, Stellite 11105-19-4, Monel 11109-50-5 12070-12-1, Tungsten carbide 12115-65-0, Chromium carbide (Cr2C3) 12597-68-1, Stainless steel , processes 12597-70-5, Bronze 12597-71-6, Brass, processes 12649-91-1 12682-01-8, Inconel 625 12725-23-4, M2 37241-55-7 57175-99-2, Babbit 144995-65-3, Diamalloy 2001 198574-15-1, Tafa 95MXC 849690-42-2, Metco 8222 861891-90-9, SHS717 916826-46-5, Tafa 140MXC 1267623-54-0, Tafa 05T 2243289-09-8, Tafa 90MXC 2243289-33-8, Tafa 96MXC 2243290-31-3, SHS9193W16 2243290-32-4, SHS9192W16 2243290-41-5, Tafa 01A
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for coating a component)

L15 ANSWER 36 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2018:1340582 CAPLUS Full-text

DOCUMENT NUMBER: 169:204126

TITLE: Vibration-damping and noise-reducing stainless steel pipe and its preparation method

INVENTOR(S): Zhu, Mingchao

PATENT ASSIGNEE(S): Hefei Wangyou Doors and Windows Co., Ltd., Peop. Rep. China

SOURCE: Faming Zhuanli Shenqing, 10pp.
CODEN: CNXXEV

DOCUMENT TYPE: Patent

LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 108300944	A	20180720	CN 2018-10330902	20180413

PRIORITY APPLN. INFO.: CN 2018-10330902 20180413

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 108300944	A	Dead	20201121

AB A practical and reliable vibration-damping and noise-reducing stainless steel pipe having good comprehensive performance, compactness and stability, and high mech. strength, surface hardness and wear resistance, and long service life is provided. The stainless steel pipe comprises the following chem. components in percentage by wt.: 0.05-0.3 of carbon, 0.4-0.8 of silicon, 0.5-1.5 of manganese, 0.1-0.3 of chromium, 0.05-0.15 of copper, 0.01-0.1 of cobalt, 0.4-0.6 of aluminum, 0.02-0.16 of calcium, 0.004-0.012 of barium, 0.02-0.06 of niobium, 0.03-0.2 of cerium, 0.05-0.3 of yttrium, 0.006-0.020 of gallium, 0.05-0.15 of boron, 0.001-0.01 of technetium, 0.05 of nitrogen and iron. The prepn. method comprises the following steps: (1) smelting of scrap steel and each alloy raw material in furnace, blowing nitrogen, melting alloy completely, refining, molding, and forging into a round steel, (2) perforation and cold rolling machine for making round steel into tube blank of a certain specification, (3) heat treatment of tube blank at 1080-1120 °C, for 90-100 min, and (4) surface treatment including alkali washing, pickling, coating, straightening, testing, and storage.

IT 2236576-37-5P, Aluminum 0.4-0.6, boron 0.05-0.15, calcium 0.02-0.16, carbon 0.05-0.3, cerium 0.03-0.2, chromium 0.1-0.3, cobalt 0.01-0.1, copper 0.05-0.15, iron bal., manganese 0.5-1.5, niobium 0.02-0.06, silicon 0.4-0.8
RL: IMF (Industrial manufacture); MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

RN 2236576-37-5 CAPLUS

CN Iron alloy, base, Fe 96-98,Mn 0.5-1.5,Si 0.4-0.8,Al 0.4-0.6,Cr 0.1-0.3,C 0-0.3,B 0-0.2,Ca 0-0.2,Ce 0-0.2,Cu 0-0.2,Co 0-0.1,Nb 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	96 - 98	7439-89-6
Mn	0.5 - 1.5	7439-96-5
Si	0.4 - 0.8	7440-21-3
Al	0.4 - 0.6	7429-90-5
Cr	0.1 - 0.3	7440-47-3
C	0 - 0.3	7440-44-0
B	0 - 0.2	7440-42-8
Ca	0 - 0.2	7440-70-2
Ce	0 - 0.2	7440-45-1
Cu	0 - 0.2	7440-50-8
Co	0 - 0.1	7440-48-4
Nb	0 - 0.1	7440-03-1

IPCI C22C0038-02; C22C0038-04; C22C0038-20; C22C0038-30; C22C0038-06; C22C0038-26; C22C0038-32; C21D0008-10; C09D0004-06; C09D0004-02; C09D0007-61

IPCR C22C0038-02 [I]; C09D0004-02 [I]; C09D0004-06 [I]; C09D0007-61 [I]; C21D0008-10 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-20 [I]; C22C0038-26 [I]; C22C0038-30 [I]; C22C0038-32 [I]

CC 55-1 (Ferrous Metals and Alloys)

ST stainless steel pipe

IT Foaming agents
Pipes and Tubes
Smelting
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

IT Attapulgitic clays
Bauxite
Sand
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

IT 26062-94-2, Polybutylene terephthalate
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(assumed monomers; vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

IT 2236576-37-5P, Aluminum 0.4-0.6, boron 0.05-0.15, calcium 0.02-0.16, carbon 0.05-0.3, cerium 0.03-0.2, chromium 0.1-0.3, cobalt 0.01-0.1, copper 0.05-0.15, iron bal., manganese 0.5-1.5, niobium 0.02-0.06, silicon 0.4-0.8
RL: IMF (Industrial manufacture); MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

IT 77-99-6, Trimethylolpropane 1477-55-0, m-Xylylenediamine 5593-70-4, Tetra-n-butyl titanate 7664-39-3, Hydrofluoric acid, uses 7697-37-2, Nitric acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

IT 79-41-4, Methacrylic acid, processes 96-33-3, Methyl acrylate 9004-35-7 24937-78-8, EVA 24968-12-5, Polybutylene terephthalate
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(vibration-damping and noise-reducing stainless steel pipe and its prepn. method)

L15 ANSWER 37 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:863056 CAPLUS Full-text
DOCUMENT NUMBER: 168:486049
TITLE: Steel welding part with aluminum or aluminum alloy plating layer and manufacture method thereof
INVENTOR(S): Pan, Hua; Su, Yongchao; Lei, Ming; Shi, Lei; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: PCT Int. Appl., 17pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018077067	A1	20180503	WO 2017-CN106516	20171017
CN 106334875	A	20170118	CN 2016-10953787	20161027
MX 2019004121	A	20190606	MX 2019-4121	20171017
KR 2019069471	A	20190619	KR 2019-7013481	20171017
KR 2292675	B1	20210823		
EP 3533558	A1	20190904	EP 2017-864438	20171017
JP 2019535894	T	20191212	JP 2019-520992	20171017
JP 6829312	B2	20210210		
US 20200038998	A1	20200206	US 2019-16339215	20190403
US 11014195	B2	20210525		
IN 201917015151	A	20190719	IN 2019-17015151	20190415

PRIORITY APPLN. INFO.:
CN 2016-10953787 A 20161027
WO 2017-CN106516 W 20171017

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2018077067	A1	Dead	20210617
CN 106334875	A	Dead	20201121
MX 2019004121	A	Alive	20201120
KR 2019069471	A	Alive	20201203
KR 2292675	B1	Alive	20210909
EP 3533558	A1	Alive	20201203
JP 6829312	B2	Alive	20210218
US 20200038998	A1	Alive	20201121
US 11014195	B2	Alive	20210604

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The invention discloses a steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof. The steel welding part with aluminum or aluminum alloy plating layer comprises a steel substrate and a plating layer, the plating layer comprises an intermetallic compd. alloy layer in contact with the substrate, and a metal alloy layer thereon; which is characterized in that on at least

one of the plated surfaces of the weld blank, the plating layer located in the area to be welded of the weld blank is completely removed, and the end face of the welding blank part plating layer removed the region to be welded is perpendicular to the surface of the substrate which is parallel to weld seam to form an included angle β, and the included angle β =0-80°. A method of manufg. steel welding part with aluminum or aluminum alloy plating layer is characterized in that it includes the steps of: obtaining weld blank by welding according to the requirements of steel welding part with aluminum or aluminum alloy plating layer, welding the area to be welded of the weld blank where the plating layer has been completely removed to form a welded joint; obtaining a part by hot stamping, selecting a cooling rate which is greater than the crit. transformation speed of the matrix martensite quenching, and cooling. This invention ensures tensile strength, elongation rate and corrosion resistance of welding joint after hot stamping.

IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-32 [I]; C22C0038-04 [I]
IPCR B23K0026-32 [I]; C22C0038-04 [I]
CC 56-9 (Nonferrous Metals and Alloys)
Section cross-reference(s): 47
ST steel laser welding corrosion strength
IT Corrosion resistance
Elongation, mechanical
Laser welding
Plating process
Tensile strength
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT Intermetallic compounds
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 1273096-81-3, Aluminum alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

L15 ANSWER 38 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:355112 CAPLUS Full-text

DOCUMENT NUMBER: 176:58213
TITLE: Numerical and experimental investigations on shot-peened high-strength steel by means of hole drilling, X-ray, synchrotron and neutron diffraction analysis
AUTHOR(S): Farajian, Majid; Hardenacke, Volker; Pfeiffer, Wulf; Klaus, Manuela; Kornmeier, Joana Rebel
CORPORATE SOURCE: Tehran Polytechnic, Iran
SOURCE: Materials Testing (2017), 59(2), 161-165
CODEN: MTAEFC
DIGITAL OBJECT ID: 10.3139/120.110978
PUBLISHER: Carl Hanser Verlag
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB Numerous exptl. works have been devoted to studying the influence of different shot peening parameters on the surface material conditions in different metals in the last decades. Most of the research work has been focused on exptl. detn. of the residual stress and its depth profile by means of X-ray diffraction and corresponding electro-polishing of the surface layers or byhole drilling method. This state of knowledge has led to the development of phenomenol. models to describe the surface material conditions qual. Since there are quite a no. of parameters, which could influence the residual stress field after shot peening, covering the whole possible process parameters combinations with the purpose of exptl. detg. the residual stress profiles could be difficult. A deeper insight into the residual stress states after shot peening could be possible on the basis of sound phys. principles by means of numerical approaches. In this study, shot peening of high strength steel S690QL has been modeled and simulated. The results have been compared with the residual stress depth profiles detd. by X-ray, synchrotron, neutron diffraction and hole drilling method.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Farajian, M	2012			International Instit	
Scholtes, B	1990			Ursachen, Ermittlung	
Schulze, V	2006			Modern Mechanical Su	
Vohringer, O	1987			Proceedings of the 3	
Wohlfahrt, W	1984			Proceedings of the 2	
Wohlfahrt, W	1982	28	71	Sagamore Army Mat Re	

IT 12604-89-6, properties
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(numerical and exptl. investigations on shot-peened high-strength steel by means of hole drilling, X-ray, synchrotron and neutron diffraction anal.)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3
Mo	0.18 - 0.28	7439-98-7
C	0.15 - 0.21	7440-44-0
Zr	0.05 - 0.15	7440-67-7
S	0 - 0.04	7704-34-9
P	0 - 0.035	7723-14-0
B	0 - 0.0025	7440-42-8

CC 55-1 (Ferrous Metals and Alloys)
ST steel residual stress shot peening hole drilling method
IT Drill cuttings
Electrochemical polishing
Friction
Neutron diffraction
Plastic deformation
Residual stress

Shot peening
Simulation and Modeling
Synchrotron radiation
Tension
X-ray
Yield strength
Young's modulus
(numerical and exptl. investigations on shot-peened high-strength steel by means of hole drilling, X-ray, synchrotron and neutron diffraction anal.)

IT 12604-89-6, properties
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(numerical and exptl. investigations on shot-peened high-strength steel by means of hole drilling, X-ray, synchrotron and neutron diffraction anal.)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 39 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2018:228290 CAPLUS Full-text
DOCUMENT NUMBER: 168:225095
TITLE: Low-carbon steel sheet and plated steel sheet for automobile parts
INVENTOR(S): Sano, Kohichi; Uno, Makoto; Nishiyama, Ryoichi; Yamaguchi, Yuji; Sugiura, Natsuko; Nakata, Masahiro
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: PCT Int. Appl., 54pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2018026015	A1	20180208	WO 2017-JP28478	20170804
TW I629367	B	20180711	TW 2017-126478	20170804
JP 6358406	B2	20180718	JP 2017-562089	20170804
KR 2019012262	A	20190208	KR 2019-7000430	20170804
KR 2205432	B1	20210120		
MX 2019000051	A	20190401	MX 2019-51	20170804
CN 109563586	A	20190402	CN 2017-80047871	20170804
CN 109563586	B	20210209		
BR 112019000422	A2	20190430	BR 2019-112019000422	20170804
EP 3495529	A1	20190612	EP 2017-837116	20170804
EP 3495529	B1	20210303		
US 20190233926	A1	20190801	US 2018-16312222	20181220
US 10889879	B2	20210112		
IN 201817049387	A	20190322	IN 2018-17049387	20181227

PRIORITY APPLN. INFO.: JP 2016-155090 A 20160805
WO 2017-JP28478 W 20170804

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2018026015	A1	Dead	20210408
TW I629367	B	Alive	20201121
JP 6358406	B2	Alive	20201121
KR 2019012262	A	Alive	20201203
KR 2205432	B1	Alive	20210218
MX 2019000051	A	Alive	20201121
CN 109563586	A	Alive	20201121
CN 109563586	B	Alive	20210218
BR 112019000422	A2	Alive	20201121
EP 3495529	A1	Indeterminate	20210304
EP 3495529	B1	Indeterminate	20210304
US 20190233926	A1	Alive	20210118
US 10889879	B2	Alive	20210122

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The steel plate has chem. compn. as: aluminum 0.010-0.6, boron 0.0005-0.1, calcium 0.0001-0.05, carbon 0.008-0.15, chromium 0.05-1, copper 0.01-2, iron and impurities balance, magnesium 0.0001-0.05,

manganese 0.60-2.5, molybdenum 0.01-1, nickel 0.01-2, niobium 0-0.2, nitrogen 0-0.006, phosphorus 0-0.05, rare earth metal 0.0001-0.05, silicon 0.01-1.7, sulfur 0-0.02, titanium 0-0.2, titanium and niobium 0.015-0.2, zirconium 0.0001-0.05, in mass%, and is provided with a structure represented by, in terms of area ratio, 5-95% ferrite and 5-95% bainite. When a crystal grain is defined as a region which is surrounded by grain boundaries having disorientation of 15°-or higher and for which the equiv. circle diam. is 0.3μm or larger, the proportion of crystal grains having an intragranular disorientation of 5-14°-relative to all of crystal grains is 20-100% in terms of area ratio. The steel plate comprises hard material crystal grains A in which ppts. or clusters with max. diam. of no larger than 8 nm are distributed in no. d. of 1×1016-1×1019 particles/cm3, and soft material crystal grains B in which ppts. or clusters with a max. diam. of no larger than 8 nm are distributed in no. d. of no higher than 1×1015 particles/cm3, and the vol.% of hard material crystal grains A/(vol.% of hard material crystal grains A+vol.% of soft material crystal grains B) is 0.1-0.9. The plated steel plate has galvannealed galvanized plating layer. The steel plate has high strength, good ductility and stretch flangeability, and high yield stress.

IT 2178084-33-6
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(low-carbon steel sheet and plated steel sheet for automobile parts)

RN 2178084-33-6 CAPLUS

CN Iron alloy, base, Fe 89-99,Mn 0.6-2.5,Cu 0-2,Ni 0-2,Si 0-1.7,Cr 0-1,Mo 0-1,Al 0-0.6,C 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1 (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	89	-	99	7439-89-6
Mn	0.6	-	2.5	7439-96-5
Cu	0	-	2	7440-50-8
Ni	0	-	2	7440-02-0
Si	0	-	1.7	7440-21-3
Cr	0	-	1	7440-47-3
Mo	0	-	1	7439-98-7
Al	0	-	0.6	7429-90-5
C	0	-	0.2	7440-44-0
Nb	0	-	0.2	7440-03-1
Ti	0	-	0.2	7440-32-6
B	0	-	0.1	7440-42-8

IPCI C22C0038-00 [I]; C22C0038-58 [I]; C21D0009-46 [N]
IPCR C22C0038-00 [I]; C21D0009-46 [N]; C22C0038-58 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST low carbon steel sheet plating automobile part
IT Automobile parts
Elongation, mechanical
Galvannealing
Grain size
Hot-dip galvanizing
Microstructure
Sheet materials
Tensile strength
Yield strength
(low-carbon steel sheet and plated steel sheet for automobile parts)
IT 2178084-33-6
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(low-carbon steel sheet and plated steel sheet for automobile parts)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 40 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2017:1893614 CAPLUS Full-text
DOCUMENT NUMBER: 175:102839

TITLE: Regularities of Oxidation and Decarburization of Special Alloy Steels in the BCC→FCC Phase Transformation Temperature Range
AUTHOR(S): Stepanov, A. B.; Knyazev, A. V.
CORPORATE SOURCE: Bardin Central Research Institute of Ferrous Metallurgy (TsNIIchermet), Moscow, Russia
SOURCE: Metallurgist (New York, NY, United States) (2017), 61(7-8), 574-578
CODEN: MTLUA8; ISSN: 0026-0894
DIGITAL OBJECT ID: 10.1007/s11015-017-0535-4
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB Regularities of oxidn. and decarburization of special alloy steels 12KhN, 30G1R, 35KhGSA, 40Kh, and 62S2KhA in the temp. range 800-950°C of their phase transformation from ferrite to austenite are investigated. It is established that for all steels there is a general regularity in steady growth of lost metal layer thickness as a result of oxidn. with an increase in heating duration and temp. For special alloy steels, the depth of the decarburized zone decreases (possibly, with a subsequent increase) with an increase in isothermal aging temp. and transition from zones for ferrite existence into austenite. Superposition of these two processes leads to an increase in decarburized zone depth on holding steel in the temp. range of the presence of ferrite. Therefore, in order to prevent the occurrence of decarburized zones that have an unfavorable effect on cold upsetting capacity for round bars, it is expedient to accelerate special alloy steel billet heating to a temp. near 900-950°C.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				A A Komissarov, Stru	
Anon				A B Stepanov, N A Ar	
Anon				A I Zaitsev, I G Rod	

IT 125842-57-1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(regularities of oxidn., decarburization of special alloy steels in bcc → fcc phase transformation temp. range)
RN 125842-57-1 CAPLUS
CN Steel, (30G1R) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	99	7439-89-6
Mn	0.9	-	1.3	7439-96-5
Si	0.17	-	0.37	7440-21-3
C	0.27	-	0.34	7440-44-0
Cr	0	-	0.30	7440-47-3
Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
B	0.001	-	0.005	7440-42-8

CC 55-3 (Ferrous Metals and Alloys)
ST special alloy steel oxidn decarburization phase transformation temp
IT Decarburization
Oxidation
Phase transition
Phase transition temperature
Temperature
(regularities of oxidn., decarburization of special alloy steels in bcc → fcc phase transformation temp. range)
IT 12773-74-9 39344-94-0, processes 125842-57-1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(regularities of oxidn., decarburization of special alloy steels in bcc → fcc phase transformation temp. range)

L15 ANSWER 41 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2017:848898 CAPLUS Full-text
DOCUMENT NUMBER: 175:192030
TITLE: Contact Fatigue Resistance of Carburized Gears from Chromium-Nickel Steels
AUTHOR(S): Rudenko, S. P.; Val'ko, A. L.
CORPORATE SOURCE: United Institute for Mechanical Engineering, National Academy of Sciences of Belarus, Minsk, Belarus
SOURCE: Metal Science and Heat Treatment (2017), 59(1-2), 60-64
CODEN: MHTRAN; ISSN: 0026-0673
DIGITAL OBJECT ID: 10.1007/s11041-017-0103-3
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB The contact fatigue resistance of carburized gears produced from chromium-nickel steels is studied. The curves of deep contact fatigue of the material of the gears are plotted in terms of the criterion of equality of the characteristics of diffusion layers. An expression for ultimate deep contact fatigue resistance of carburized gears is derived.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				A A Susin, Thermoche	
Anon				A I Petrusevich, Con	
Anon				A N Utkina, Yu Yu Ch	
Anon				B A Balashov, R R Ga	
Anon				B V Gold, E P Obolen	
Anon				E B Vulgakov (ed.),	
Anon				E I Tesker, Advanced	
Anon				N M Ryzhov, "Technol	
Anon				S P Rudenko and A L	
Anon				S P Rudenko, "A stud	
Anon				S P Rudenko, "Comput	
Anon				S P Rudenko, "Fatigu	
Anon				S P Rudenko, A L Val	
Anon				V E Antonyuk, B V Iv	
Anon				Yu S Eliseev, V V Kr	

IT 37312-00-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(contact fatigue resistance of carburized gears from chromium-nickel steels)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST chromium nickel steel carburized gear contact fatigue resistance
IT Diffusion
Fatigue resistance

Gears
Microhardness
Microstructure
(contact fatigue resistance of carburized gears from chromium-nickel steels)

IT 12681-03-7 12742-08-4 37312-00-8 39411-21-7
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(contact fatigue resistance of carburized gears from chromium-nickel steels)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 42 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2017:342418 CAPLUS Full-text
DOCUMENT NUMBER: 166:297159
TITLE: Method for manufacturing steel plate with aluminum or aluminum alloy coating by hot stamping
INVENTOR(S): Liu, Xin; Hong, Zhenjun; Tan, Ning; Jin, Xinyan; Liu, Junxiang; Hong, Jiyao
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 15pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 106466697	A	20170301	CN 2016-10664566	20160812
CN 106466697	B	20200131		

PRIORITY APPLN. INFO.: CN 2016-10664566 20160812
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 106466697	A	Alive	20201121
CN 106466697	B	Alive	20201121

AB The invention discloses a manuf. method of steel plate, which comprises the following steps: blanking the steel plate with aluminum or aluminum alloy coating by blanking or laser cutting, induction heating, hot stamping in die, and cooling. The temp. and time of heating are detd. by the thickness of steel plate. The components of the steel plate is as follows: C 0.08-0.8%, Si 0.05-1.0%, Mn 0.1-5%, P<0.3%, S<0.1%, Al<0.3%, Ti<0.5%, B 0.0005-0.1%, Cr 0.01-3%, and balance of Fe and inevitable impurities. The coating comprises alloy layer, aluminum enriched intermetallic compd. layer, intermediate layer and surface layer. The components of the alloy layer is Si 0-6%, Fe 75-96%, Al 2-12%; the components of the aluminum enriched intermetallic compd. layer is Si 0-2%, Fe 30-50%, Al 40-60%; the components of the intermediate layer is Si 2-6%, Fe 50-65%, Al 20-35%; and the components of the surface layer is Si 2-6%, Fe 50-65%, Al 20-35%. The product has high strength, complex shape, good formability, high precision, and small springback, which can be used for automobile parts such as bumper, pillar reinforced plate, floor inside passage, and stiffening beam, etc..
IT 2067242-22-0P, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(method for manufg. steel plate with aluminum or aluminum alloy coating by hot stamping)
RN 2067242-22-0 CAPLUS
CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5

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    Cr      0   -   3       7440-47-3
    Si      0   -   1       7440-21-3
    C       0.1 -   0.8     7440-44-0
    Ti      0   -   0.5     7440-32-6
    Al      0   -   0.3     7429-90-5
    P       0   -   0.3     7723-14-0
    B       0   -   0.1     7440-42-8
    S       0   -   0.1     7704-34-9

IPCI B21D0053-88; C22C0038-02; C22C0038-04; C22C0038-06; C22C0038-32;
     C22C0038-60; C23C0002-12; C23C0002-40
IPCR B21D0053-88 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I];
     C22C0038-32 [I]; C22C0038-60 [I]; C23C0002-12 [I]; C23C0002-40 [I]
CC   55-1 (Ferrous Metals and Alloys)
ST   hot stamping aluminum alloy steel plate coating manuf
IT   Coating materials
     Cooling
     Induction heating
     Industrial manufacturing
     Laser cutting
     Quenching (cooling)
     Transmissions (mechanical)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)
IT   Metalworking
        (stamping, hot; method for manufg. steel plate with aluminum
        or aluminum alloy coating by hot stamping)
IT   2067242-22-0P, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8,
     chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur
     0-0.1, titanium 0-0.5, iron bal.   2087430-40-6P, Aluminum 2-12, iron
     75-96, silicon 0-6   2087430-41-7P, Aluminum 40-60, iron 30-50, silicon
     0-2   2087430-42-8P, Aluminum 20-35, iron 50-65, silicon 2-6
     RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical
     process); TEM (Technical or engineered material use); PREP (Preparation);
     PROC (Process); USES (Uses)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)
IT   2087430-39-3, Iron 0-4, silicon 5-11, Aluminum bal.
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)
IT   7429-90-5, Aluminum, processes
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (method for manufg. steel plate with aluminum or aluminum
        alloy coating by hot stamping)


L15  ANSWER 43 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2017:227313  CAPLUS Full-text
DOCUMENT NUMBER:          166:249360
TITLE:                    Hot rolled steel sheet and its manufacture for
                          automobile parts
INVENTOR(S):              Sakakibara, Chikami; Sugiura, Natsuko; Tanaka,
                          Yasuaki; Tanei, Hiroshi; Fujii, Takashi; Yokoyama,
                          Takashi
PATENT ASSIGNEE(S):       Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE:                   Jpn. Kokai Tokkyo Koho, 16pp.
                          CODEN: JKXXAF
DOCUMENT TYPE:            Patent
LANGUAGE:                 Japanese
FAMILY ACC. NUM. COUNT:   2
PATENT INFORMATION:
     PATENT NO.           KIND  DATE        APPLICATION NO.          DATE
     ---------------      ----  --------    ---------------------    --------
     JP 2017031454         A    20170209    JP 2015-150831           20150730
     JP 6620446            B2   20191218
     WO 2017022025         A1   20170209    WO 2015-JP71845          20150731
PRIORITY APPLN. INFO.:                     JP 2015-150831        T0 20150730
PATENT STATUS PATENT INFORMATION:
     PATENT NO.           KIND  STATUS          STATUS DATE
     ---------------      ----  -------------   -----------
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     JP 2017031454        A    Alive           20201121
     JP 6620446           B2   Alive           20201120
     WO 2017022025        A1   Dead            20201202
AB   To provide hot-rolled steel plate excellent in pickling property and
     without an increase in equipment cost, generation of internal oxide
     layer of a high strength hot rolled steel sheet contg. relatively
     large amts. of Si and Mn is suppressed, and method for manufg. thereof.
     Hot-rolled steel plate comprises C: 0.04-0.6%, Si: 0.01-3%, Mn: 0.1-5%,
     P: 0.04% or less, S: 0.05% or less, Al: 0.001-2%, N: 0.01% or less, O:
     0.01% or less, one or more of Sb, Sn and Te: total amt. of 0.01-0.3% and
     remainder of Fe and unavoidable impurities, and has thickness of the
     internal oxide layer of 5 μm or less, a concd. layer of Sb, Sn and
     Te as an upper layer of the internal oxide layer, and has mech.
     properties with a tensile strength of 590 MPa or more.
IT   2079034-18-5P
     RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
     engineered material use); PREP (Preparation); USES (Uses)
        (high strength hot rolled steel sheet and its manuf. for
        automobile parts)
RN   2079034-18-5  CAPLUS
CN   Iron alloy, base, Fe 80-100,Mn 0.1-5,Si 0-3,Al 0-2,Cr 0-2,Cu 0-2,Ni 0-2,Mo
     0-1,C 0-0.6,Nb 0-0.3,Sb 0-0.3,Sn 0-0.3,Te 0-0.3,Ti 0-0.3,V 0-0.3,B 0-0.1
     (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+=============+===============
    Fe      80   - 100        7439-89-6
    Mn       0.1 -   5        7439-96-5
    Si       0   -   3        7440-21-3
    Al       0   -   2        7429-90-5
    Cr       0   -   2        7440-47-3
    Cu       0   -   2        7440-50-8
    Ni       0   -   2        7440-02-0
    Mo       0   -   1        7439-98-7
    C        0   -   0.6      7440-44-0
    Nb       0   -   0.3      7440-03-1
    Sb       0   -   0.3      7440-36-0
    Sn       0   -   0.3      7440-31-5
    Te       0   -   0.3     13494-80-9
    Ti       0   -   0.3      7440-32-6
    V        0   -   0.3      7440-62-2
    B        0   -   0.1      7440-42-8

IPCI C22C0038-00 [I]; C22C0038-60 [I]; C21D0009-46 [I]; C22C0038-00 [I];
     C22C0038-60 [I]; C21D0009-46 [I]
IPCR C22C0038-00 [I]; C21D0009-46 [I]; C22C0038-60 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   hot rolled steel sheet manuf automobile part
IT   Automobile parts
     Casting of metals
     Hot rolling
     Melting
     Microstructure
     Pickling
     Sheet materials
     Tensile strength
        (high strength hot rolled steel sheet and its manuf. for
        automobile parts)
IT   2079034-18-5P
     RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or
     engineered material use); PREP (Preparation); USES (Uses)
        (high strength hot rolled steel sheet and its manuf. for
        automobile parts)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 44 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2017:100416  CAPLUS Full-text
DOCUMENT NUMBER:         166:179501
TITLE:                   Steel welding part with aluminum or aluminum alloy
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plating layer and manufacture method thereof
INVENTOR(S): Pan, Hua; Su, Yongchao; Lei, Ming; Shi, Lei; Jiang, Haomin
PATENT ASSIGNEE(S): Baoshan Iron & Steel Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 8pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 106334875	A	20170118	CN 2016-10953787	20161027
WO 2018077067	A1	20180503	WO 2017-CN106516	20171017
MX 2019004121	A	20190606	MX 2019-4121	20171017
KR 2019069471	A	20190619	KR 2019-7013481	20171017
KR 2292675	B1	20210823		
EP 3533558	A1	20190904	EP 2017-864438	20171017
JP 2019535894	T	20191212	JP 2019-520992	20171017
JP 6829312	B2	20210210		
US 20200038998	A1	20200206	US 2019-16339215	20190403
US 11014195	B2	20210525		
IN 201917015151	A	20190719	IN 2019-17015151	20190415

PRIORITY APPLN. INFO.: CN 2016-10953787 A 20161027
WO 2017-CN106516 W 20171017

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 106334875	A	Dead	20201121
WO 2018077067	A1	Dead	20210617
MX 2019004121	A	Alive	20201120
KR 2019069471	A	Alive	20201203
KR 2292675	B1	Alive	20210909
EP 3533558	A1	Alive	20201203
JP 6829312	B2	Alive	20210218
US 20200038998	A1	Alive	20201121
US 11014195	B2	Alive	20210604

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention discloses a steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof. The steel welding part with aluminum or aluminum alloy plating layer comprises a steel substrate and a plating layer, the plating layer comprises an intermetallic compd. alloy layer in contact with the substrate, and a metal alloy layer thereon; which is characterized in that on at least one of the plated surfaces of the weld blank, the plating layer located in the area to be welded of the weld blank is completely removed, and the end face of the welding blank part plating layer removed the region to be welded is perpendicular to the surface of the substrate which is parallel to weld seam to form an included angle β, and the included angle β =0-80°. A method of manufg. steel welding part with aluminum or aluminum alloy plating layer is characterized in that it includes the steps of: obtaining weld blank by welding according to the requirements of steel welding part with aluminum or aluminum alloy plating layer, welding the area to be welded of the weld blank where the plating layer has been completely removed to form a welded joint; obtaining a part by hot stamping, selecting a cooling rate which is greater than the crit. transformation speed of the matrix martensite quenching, and cooling. This invention ensures tensile strength, elongation rate and corrosion resistance of welding joint after hot stamping.

IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)

RN 2067242-22-0 CAPLUS

CN Iron alloy, base, Fe 89-100,Mn 0.1-5,Cr 0-3,Si 0-1,C 0.1-0.8,Ti 0-0.5,Al 0-0.3,P 0-0.3,B 0-0.1,S 0-0.1 (CA INDEX NAME)

Component Component Component

	Percent	Registry Number
Fe	89 - 100	7439-89-6
Mn	0.1 - 5	7439-96-5
Cr	0 - 3	7440-47-3
Si	0 - 1	7440-21-3
C	0.1 - 0.8	7440-44-0
Ti	0 - 0.5	7440-32-6
Al	0 - 0.3	7429-90-5
P	0 - 0.3	7723-14-0
B	0 - 0.1	7440-42-8
S	0 - 0.1	7704-34-9

IPCI B23K0026-32; C22C0038-04; C22C0038-02; C22C0038-06; C22C0038-14; C22C0038-18; C23C0002-12; B23K0103-20
IPCR B23K0026-32 [I]; B23K0103-20 [N]; C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-14 [I]; C22C0038-18 [I]; C23C0002-12 [I]
CC 56-9 (Nonferrous Metals and Alloys)
Section cross-reference(s): 47
ST steel welding part aluminum alloy plating layer
IT Metalworking
(stamping, hot; steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT Corrosion-resistant materials
Industrial manufacturing
Joints, mechanical
Laser ablation
Laser welding
Plating process
Welding apparatus
Welds
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 12003-42-8 12004-62-5 12043-58-2
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 1273096-81-3P, Aluminum alloy
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
IT 2067242-22-0, Aluminum 0-0.3, boron 0-0.1, carbon 0.1-0.8, chromium 0-3, manganese 0.1-5, phosphorus 0-0.3, silicon 0-1, sulfur 0-0.1, titanium 0-0.5, iron bal.
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel welding part with aluminum or aluminum alloy plating layer and manuf. method thereof)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 45 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2016:2111331 CAPLUS Full-text
DOCUMENT NUMBER: 166:110631
TITLE: An anti-water erosion titanium alloy turbine blade
INVENTOR(S): Liu, Da; Wang, Heping; Zong, Guoyi
PATENT ASSIGNEE(S): Nanjing Saida Machinery Manufacturing Co., Ltd., Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing, 8pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 106244853	A	20161221	CN 2016-10753552	20160830
CN 106244853	B	20180406		
PRIORITY APPLN. INFO.:			CN 2016-10753552	20160830

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
CN 106244853	A	Alive	20201121
CN 106244853	B	Alive	20201121

AB The present invention discloses an anti-water erosion titanium alloy turbine blade. The turbine blade is processed by erosion resistant titanium alloy steel. This erosion resistant titanium alloy steel comprises the following components by wt. percent: Al:10.55-12.67%, Mo:1.05-2.24%, V:0.72-0.85%, Fe:0.85-0.87%, Ni: 2.12-3.54%, Si:0.43-0.54%, Cr:0.21-0.32%, Nb:0.35-0.47%, Sn:0.37-0.49%, In:0.05-0.07%, Cu:0.03-0.04%, C:0.13-0.25%, Ce:0.05-0.07%, Cu:0.01-0.02%, Mn:0.51-0.63%, B:0.052-0.074%, titanium and inevitable nonmetal inclusions as balance. Except anticorrosion ability, the invention also has good antistatic properties, absorption and thermal insulation and surface anti-fouling properties, and adds rare earth elements for improving wearability of material with multiple purposes, and obtains unexpected technique effect. The inventive turbine blade is coated with composite membrane on its outer surface, for increasing anticorrosion ability, and enhancing working life of the turbine blade. Addn. of nano material can improve wearability of composite membrane, which obtains unexpected technique effect.

IT 2055842-78-7, Aluminum 12-13, boron 0.05-0.07, carbon 0.1-0.2, cerium 0.05-0.07, chromium 0.2-0.3, indium 0.05-0.07, iron 0.8-0.9, manganese 0.5-0.6, molybdenum 1.0-2.2, nickel 2.1-3.5, niobium 0.4-0.5, silicon 0.4-0.5, tin 0.4-0.5, vanadium 0.7-0.8, titanium bal.
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(anti-water erosion titanium alloy turbine blade)

RN 2055842-78-7 CAPLUS

CN Titanium alloy, base, Ti 77-81,Al 12-13,Ni 2.1-3.5,Mo 1-2.2,Fe 0.8-0.9,V 0.7-0.8,Mn 0.5-0.6,Nb 0.4-0.5,Si 0.4-0.5,Sn 0.4-0.5,Cr 0.2-0.3,C 0.1-0.2,B 0-0.1,Ce 0-0.1,In 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Ti	77 - 81	7440-32-6
Al	12 - 13	7429-90-5
Ni	2.1 - 3.5	7440-02-0
Mo	1 - 2.2	7439-98-7
Fe	0.8 - 0.9	7439-89-6
V	0.7 - 0.8	7440-62-2
Mn	0.5 - 0.6	7439-96-5
Nb	0.4 - 0.5	7440-03-1
Si	0.4 - 0.5	7440-21-3
Sn	0.4 - 0.5	7440-31-5
Cr	0.2 - 0.3	7440-47-3
C	0.1 - 0.2	7440-44-0
B	0 - 0.1	7440-42-8
Ce	0 - 0.1	7440-45-1
In	0 - 0.1	7440-74-6

IPCI C22C0014-00; C22F0001-18; F01D0005-12
IPCR C22C0014-00 [I]; C22F0001-18 [I]; F01D0005-12 [I]
CC 56-6 (Nonferrous Metals and Alloys)
IT 2055842-78-7, Aluminum 12-13, boron 0.05-0.07, carbon 0.1-0.2, cerium 0.05-0.07, chromium 0.2-0.3, indium 0.05-0.07, iron 0.8-0.9, manganese 0.5-0.6, molybdenum 1.0-2.2, nickel 2.1-3.5, niobium 0.4-0.5, silicon 0.4-0.5, tin 0.4-0.5, vanadium 0.7-0.8, titanium bal.
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(anti-water erosion titanium alloy turbine blade)

L15 ANSWER 46 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2016:2049760 CAPLUS Full-text
DOCUMENT NUMBER: 167:333389
TITLE: Method for hot forming a coated metal part and formed part
INVENTOR(S): Verloop, Willem Cornelis; Van Genderen, Marc Jacco; Van Tol, Ronald Theodoor; Hensen, Guido Cornelis; Loiseaux, Jenny

PATENT ASSIGNEE(S): Tata Steel IJmuiden B.V., Neth.
SOURCE: U.S., No pp. given
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 9127329	B2	20150908	US 2013-13818041	20130220
US 20130153094	A1	20130620		
WO 2012028224	A1	20120308	WO 2011-EP3601	20110719

PRIORITY APPLN. INFO.: EP 2010-9041 A 20100831
WO 2011-EP3601 W 20110719

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
US 9127329	B2	Alive	20201121
US 20130153094	A1	Alive	20201121
WO 2012028224	A1	Dead	20201201

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A method for manufg. a coated part having very high mech. properties using hot forming techniques. The method includes: -providing an annealed steel strip or blank or pre-shaped part that was coated with a metal or metal alloy before the annealing -if a strip is provided, cutting a blank from the strip before or after the annealing -optionally forming a pre-shaped part from the blank -heating the blank or preshaped part to a temp. of 500° C. at an av. heating rate of 16° C./s or more -further heating the blank or pre-shaped part to a temp. between 700 and 1000° C. -hot forming the blank or preshaped part into a hot formed part -hardening the hot formed part. A method for manufg. a coated steel strip, blank or pre-shaped part, and a coated steel strip, blank or part and a hot formed part.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	2009			DE 102008022400 A1	CAPLUS
Anon	2009			WO 2009021743 A1	CAPLUS
Anon	2009			WO 2009096351 A1	CAPLUS
Anon	2010			WO 2010005121 A1	CAPLUS
Anon	2010			WO 2010069588 A1	CAPLUS
Anon	2010			WO 2010085983 A1	CAPLUS
Anon	2010			EP 2177641 A1	CAPLUS
Anon	2002			"Glossary of Metallu	
Anon	2011			International Search	
Brandstatter	2011			US 20110045316 A1	CAPLUS
Hensen	2011			US 20110236719 A1	CAPLUS
Maki	2011			US 20110174418 A1	CAPLUS
Mehler	1962			US 3056694 A	CAPLUS
Oh	2008			US 20080286603 A1	CAPLUS
Thirion	2012			US 20120085467 A1	CAPLUS
Toki	2011			US 20110048585 A1	CAPLUS
Vlot	2010			US 20100026048 A1	CAPLUS

IT 1360605-36-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manuf. coated steel parts by hot forming)
RN 1360605-36-2 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.1-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.1 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6

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    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    Nb      0   -   0.1      7440-03-1
    P       0   -   0.1      7723-14-0
    V       0   -   0.1      7440-62-2

IPCI C21D0008-02 [I]; C21D0009-46 [I]; C23C0002-06 [I]; C23C0002-40 [I];
     B32B0015-01 [I]; C21D0001-673 [I]; C21D0008-04 [I]; C21D0009-48 [I];
     C22C0038-02 [I]; C22C0038-04 [I]; C23C0010-28 [I]; C23C0010-60 [I];
     C21D0008-02 [I]; B32B0015-01 [I]
IPCR C21D0008-02 [I]; B32B0015-01 [I]; C21D0001-673 [I]; C21D0008-04 [I];
     C21D0009-46 [I]; C21D0009-48 [I]; C22C0038-02 [I]; C22C0038-04 [I];
     C23C0002-06 [I]; C23C0002-40 [I]; C23C0010-28 [I]; C23C0010-60 [I]
NCL  001/001.000; 148/533.000; 148/330.000
CC   55-3 (Ferrous Metals and Alloys)
ST   steel strip coating hot deformation
IT   Plastic deformation
        (hot; method for manuf. coated steel parts by hot
        forming)
IT   1360605-37-3
     RL: TEM (Technical or engineered material use); USES (Uses)
        (coating; method for manuf. coated steel
        parts by hot forming)
IT   1360605-36-2
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (method for manuf. coated steel parts by hot
        forming)


L15  ANSWER 47 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2016:1997298  CAPLUS Full-text
DOCUMENT NUMBER:         167:180612
TITLE:                   Coated steel strips, methods of making the same,
                         methods of using the same, stamping blanks prepared
                         from the same, stamped products prepared from the
                         same, and articles of manufacture which contain such a
                         stamped product
INVENTOR(S):             Drillet, Pascal; Spehner, Dominique; Kefferstein,
                         Ronald
PATENT ASSIGNEE(S):      Arcelormittal France, Fr.
SOURCE:                  U.S. Pat. Appl. Publ., No pp. given
                         CODEN: USXXCO
DOCUMENT TYPE:           Patent
LANGUAGE:                English
FAMILY ACC. NUM. COUNT:  2
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    ---------------------    --------
     US 20110165436       A1   20110707    US 2011-447777           20110318
     WO 2008053273        A1   20080508    WO 2006-IB4019           20061030
     EP 3290199           A1   20180307    EP 2017-192410           20061030
     EP 3290199           B1   20190821
     EP 3290200           A1   20180307    EP 2017-192418           20061030
     EP 3587104           A1   20200101    EP 2019-185736           20061030
     EP 3587105           A1   20200101    EP 2019-185743           20061030
     US 20130029172       A1   20130131    US 2012-13621015         20120915
     US 9708683           B2   20170718
     US 20170260603       A1   20170914    US 2017-15606770         20170526
     US 10550447          B2   20200204
     US 20190271055       A1   20190905    US 2019-16413774         20190516
     US 10590507          B2   20200317
     US 20190271056       A1   20190905    US 2019-16413799         20190516
     US 10961602          B2   20210330
     US 20190271057       A1   20190905    US 2019-16413825         20190516
     US 11041226          B2   20210622
     US 20190271058       A1   20190905    US 2019-16414022         20190516
     US 10597747          B2   20200324
     US 20190276912       A1   20190912    US 2019-16413729         20190516
     US 10577674          B2   20200303
     US 20210262055       A1   20210826    US 2021-17319306         20210513
PRIORITY APPLN. INFO.:                     WO 2006-IB4019       W   20061030
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EP 2006-842403	A3	20061030
EP 2017-192410	A3	20061030
US 2011-447777	A3	20110318
US 2012-13621015	A1	20120915
US 2017-15606770	A1	20170526
US 2019-16413825	A1	20190516

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
US 20110165436	A1	Alive	20201120
WO 2008053273	A1	Dead	20201202
EP 3290199	A1	Indeterminate	20201107
EP 3290199	B1	Indeterminate	20201106
EP 3290200	A1	Alive	20201202
EP 3587104	A1	Alive	20201201
EP 3587105	A1	Alive	20201202
US 20130029172	A1	Alive	20201121
US 9708683	B2	Alive	20201121
US 20170260603	A1	Alive	20201120
US 10550447	B2	Alive	20201121
US 20190271055	A1	Alive	20201121
US 10590507	B2	Alive	20201121
US 20190271056	A1	Alive	20201121
US 10961602	B2	Alive	20210408
US 20190271057	A1	Alive	20210401
US 11041226	B2	Alive	20210701
US 20190271058	A1	Alive	20201120
US 10597747	B2	Alive	20201121
US 20190276912	A1	Alive	20201121
US 10577674	B2	Alive	20201121
US 20210262055	A1	Alive	20210902

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Coated steel having a well defined and uniform thickness is useful and advantageous for prepg. products by hot stamping. Products prepd. by hot stamping such a steel are particularly advantageous when subjected to a subsequent spot welding step.

IT 1022915-01-0
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum coated steel strips stamping blanks and articles of manuf. which contain such a stamped product)

RN 1022915-01-0 CAPLUS

CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

INCL 428653000; 072342100; 072047000
IPCI B32B0015-01 [I]; B21D0022-00 [I]; C21D0009-46 [I]
IPCR B32B0015-01 [I]; B21D0022-00 [I]; C21D0009-46 [I]
NCL 428/653.000; 072/047.000; 072/342.100
CC 55-11 (Ferrous Metals and Alloys)
ST aluminum coated steel strip stamping article spot welding
IT Metalworking
(stamping; aluminum coated steel strips stamping blanks and articles of manuf. which contain such a stamped product)
IT 7429-90-5, Aluminum, uses 952598-91-3, Aluminum 87-90, iron 2-4, silicon 8-11
RL: NUU (Other use, unclassified); USES (Uses)
(aluminum coated steel strips stamping blanks and articles of manuf. which contain such a stamped product)

IT 1022915-01-0
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum coated steel strips stamping blanks and articles of manuf. which contain such a stamped product)

L15 ANSWER 48 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2016:1770673 CAPLUS Full-text
DOCUMENT NUMBER: 165:549448
TITLE: Production of hot or cold strips from steel having high copper content
INVENTOR(S): Redenius, Alexander; Evertz, Thomas; Palzer, Peter
PATENT ASSIGNEE(S): Salzgitter Flachstahl GmbH, Germany
SOURCE: PCT Int. Appl., 23pp.; Chemical Indexing Equivalent to 165:549447 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2016174020	A1	20161103	WO 2016-EP59266	20160426
DE 102015106780	A1	20161103	DE 2015-102015106780	20150430
PRIORITY APPLN. INFO.:			DE 2015-102015106780 A	20150430

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2016174020	A1	Dead	20201201
DE 102015106780	A1	Dead	20201120

AB A hot or cold strip of steel with high copper content, is manufd. by: melting a steel melt contg. (in wt.%) 0-0.4% C, 0-3% Mn, 0-2% Al, 0-2% Si, more than 0.8% Cu, 0-0.2% P, 0-0.05% S, and 0-0.3% N, with optional addn. of Sn, Ni, Cr, V, Nb, Ti, Mo, W, B, Co, Sb and/or Zr, the remainder being iron and unavoidable impurities; casting the melt under an atm. having an oxygen content <10 vol.%, by a near-net-shape casting method, in particular horizontal strip casting or vertical casting according to the two-roll method, into a pre-strip having a thickness in of 1-30 mm; cooling the cast pre-strip at a cooling rate ≥100 K/s at the actively cooled strip surface until forming a rigid boundary layer.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
FANG YUAN	2014			US 20140366602 A1	
GUELTON NICOLAS PATRICE	2004			EP 1466024 A1	CAPLUS
IKI HIROSHI	2000			JP 2000045045 A	CAPLUS
IUNG THIERRY	2001			EP 1072689 A1	CAPLUS
MARUYAMA NAOKI	2005			JP 2005036271 A	CAPLUS
MIZOGUCHI TOSHIAKI NIPP	1995			EP 0641867 A1	CAPLUS
UENISHI AKIHIRO	2000			EP 0969112 A1	CAPLUS
YAMAKAWA TSUNAHIRO	1992			US 5098489 A	CAPLUS

IT 2031158-69-5P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(strips; prodn. of hot or cold strips from steel having high copper content)
RN 2031158-69-5 CAPLUS
CN Iron alloy, base, Fe 68-99,Cu 0.8-5,Cr 0-4,Co 0-3,Mn 0-3,Mo 0-3,W 0-3,Al 0-2,Ni 0-2,Si 0-2,Nb 0-0.9,Ti 0-0.9,V 0-0.9,Sn 0-0.5,Zr 0-0.5,C 0-0.4,B 0-0.3,N 0-0.3,P 0-0.2 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	68 - 99	7439-89-6
Cu	0.8 - 5	7440-50-8
Cr	0 - 4	7440-47-3
Co	0 - 3	7440-48-4
Mn	0 - 3	7439-96-5
Mo	0 - 3	7439-98-7

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    W       0   -   3        7440-33-7
    Al      0   -   2        7429-90-5
    Ni      0   -   2        7440-02-0
    Si      0   -   2        7440-21-3
    Nb      0   -   0.9      7440-03-1
    Ti      0   -   0.9      7440-32-6
    V       0   -   0.9      7440-62-2
    Sn      0   -   0.5      7440-31-5
    Zr      0   -   0.5      7440-67-7
    C       0   -   0.4      7440-44-0
    B       0   -   0.3      7440-42-8
    N       0   -   0.3     17778-88-0
    P       0   -   0.2      7723-14-0

IPCI C22C0038-00 [I]; B22D0011-00 [I]; B22D0011-06 [I]; B22D0011-106 [I];
     B22D0011-124 [I]; B22D0011-14 [I]; B22D0011-22 [I]; B22D0015-00 [I];
     B22D0037-00 [I]; C21D0006-00 [I]; C21D0008-02 [I]; C21D0001-26 [I];
     C22C0038-02 [I]; C22C0038-04 [I]; C22C0038-06 [I]; C22C0038-16 [I];
     B22D0011-112 [I]; C21D0006-02 [I]
IPCR C22C0038-00 [I]; B22D0011-00 [I]; B22D0011-06 [I]; B22D0011-106 [I];
     B22D0011-112 [I]; B22D0011-124 [I]; B22D0011-14 [I]; B22D0011-22 [I];
     B22D0015-00 [I]; B22D0037-00 [I]; C21D0001-26 [I]; C21D0006-00 [I];
     C21D0006-02 [I]; C21D0008-02 [I]; C22C0038-02 [I]; C22C0038-04 [I];
     C22C0038-06 [I]; C22C0038-16 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   hot cold strip steel copper casting cooling
IT   Annealing
     Casting of metals
     Cooling
     Hot rolling
        (prodn. of hot or cold strips from steel having high copper
        content)
IT   124-38-9, Carbon dioxide, uses   630-08-0, Carbon monoxide, uses
     7440-37-1, Argon, uses   7727-37-9, Nitrogen, uses   7782-44-7, Oxygen,
     uses
     RL: NUU (Other use, unclassified); USES (Uses)
        (casting atm.; prodn. of hot or cold strips from steel having
        high copper content)
IT   2031158-68-4P   2031158-69-5P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (strips; prodn. of hot or cold strips from steel having high
        copper content)


L15  ANSWER 49 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2016:1770568  CAPLUS Full-text
DOCUMENT NUMBER:         165:549447
TITLE:                   Production of hot or cold strips from steel having
                         high copper content
INVENTOR(S):             Redenius, Alexander; Evertz, Thomas; Palzer, Peter
PATENT ASSIGNEE(S):      Salzgitter Flachstahl GmbH, Germany
SOURCE:                  Ger. Offen., 9pp.; Chemical Indexing Equivalent to
                         165:549448 (WO)
                         CODEN: GWXXBX
DOCUMENT TYPE:           Patent
LANGUAGE:                German
FAMILY ACC. NUM. COUNT:  2
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     DE 102015106780      A1   20161103    DE 2015-102015106780     20150430
     WO 2016174020        A1   20161103    WO 2016-EP59266          20160426
PRIORITY APPLN. INFO.:                     DE 2015-102015106780 A   20150430
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  -------------   -----------
     DE 102015106780      A1   Dead            20201120
     WO 2016174020        A1   Dead            20201201
AB   A hot or cold strip of steel with high copper content, is manufd. by:
     melting a steel melt contg. (in wt.%) 0-0.4% C, 0-3% Mn, 0-2% Al, 0-2%
     Si, more than 0.8% Cu, 0-0.2% P, 0-0.05% S, and 0-0.3% N, with optional
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addn. of Sn, Ni, Cr, V, Nb, Ti, Mo, W, B, Co, Sb and/or Zr, the remainder being iron and unavoidable impurities; casting the melt under an atm. having an oxygen content <10 vol.%, by a near-net-shape casting method, in particular horizontal strip casting or vertical casting according to the two-roll method, into a pre-strip having a thickness in of 1-30 mm; cooling the cast pre-strip at a cooling rate ≥100 K/s at the actively cooled strip surface until forming a rigid boundary layer.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 112013001434 T5	CAPLUS
Anon				WO 2015003755 A1	CAPLUS
Anon				EP 2546368 A1	CAPLUS
Anon				DE 60306365 T2	
Anon	2013			M Bausch et al:Ultra	

IT 2031158-69-5P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(strips; prodn. of hot or cold strips from steel having high copper content)

RN 2031158-69-5 CAPLUS

CN Iron alloy, base, Fe 68-99,Cu 0.8-5,Cr 0-4,Co 0-3,Mn 0-3,Mo 0-3,W 0-3,Al 0-2,Ni 0-2,Si 0-2,Nb 0-0.9,Ti 0-0.9,V 0-0.9,Sn 0-0.5,Zr 0-0.5,C 0-0.4,B 0-0.3,N 0-0.3,P 0-0.2 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	68 - 99	7439-89-6
Cu	0.8 - 5	7440-50-8
Cr	0 - 4	7440-47-3
Co	0 - 3	7440-48-4
Mn	0 - 3	7439-96-5
Mo	0 - 3	7439-98-7
W	0 - 3	7440-33-7
Al	0 - 2	7429-90-5
Ni	0 - 2	7440-02-0
Si	0 - 2	7440-21-3
Nb	0 - 0.9	7440-03-1
Ti	0 - 0.9	7440-32-6
V	0 - 0.9	7440-62-2
Sn	0 - 0.5	7440-31-5
Zr	0 - 0.5	7440-67-7
C	0 - 0.4	7440-44-0
B	0 - 0.3	7440-42-8
N	0 - 0.3	17778-88-0
P	0 - 0.2	7723-14-0

IPCI C22C0038-04 [I]; C22C0038-16 [I]; C21D0008-00 [I]; B22D0011-06 [I]; B22D0011-116 [I]; B22D0011-12 [I]; C22C0111-00 [I]

IPCR C22C0038-04 [I]; B22D0011-06 [I]; B22D0011-116 [I]; B22D0011-12 [I]; C21D0008-00 [I]; C22C0038-16 [I]; C22C0111-00 [N]

CC 55-3 (Ferrous Metals and Alloys)

ST hot cold strip steel copper casting cooling

IT Annealing
Casting of metals
Cooling
Hot rolling
(prodn. of hot or cold strips from steel having high copper content)

IT 124-38-9, Carbon dioxide, uses 630-08-0, Carbon monoxide, uses 7440-37-1, Argon, uses 7727-37-9, Nitrogen, uses 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(casting atm.; prodn. of hot or cold strips from steel having high copper content)

IT 2031158-68-4P 2031158-69-5P
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(strips; prodn. of hot or cold strips from steel having high copper content)

L15 ANSWER 50 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2016:1617614 CAPLUS Full-text
DOCUMENT NUMBER: 165:466273
TITLE: Composition and manufacture of carbon steel sheet suitable for hot stamping, and hot stamping molded parts
INVENTOR(S): Azuma, Masafumi; Suwa, Yoshihiro; Kondo, Yusuke; Sato, Koichi
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: PCT Int. Appl., 49pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2016158961	A1	20161006	WO 2016-JP60145	20160329
CA 2979978	A1	20161006	CA 2016-2979978	20160329
KR 2017122823	A	20171106	KR 2017-7027982	20160329
KR 2000863	B1	20190716		
CN 107427889	A	20171201	CN 2016-80017529	20160329
CN 107427889	B	20191025		
MX 2017012377	A	20171214	MX 2017-12377	20160329
EP 3278895	A1	20180207	EP 2016-772842	20160329
EP 3278895	B1	20200311		
BR 112017020165	A2	20180605	BR 2017-112017020165	20160329
RU 2683397	C1	20190328	RU 2017-135379	20160329
JP 6515356	B2	20190522	JP 2017-510030	20160329
ES 2781465	T3	20200902	ES 2016-772842	20160329
TW I597370	B	20170901	TW 2016-110064	20160330
US 20180044754	A1	20180215	US 2017-15559731	20170919
IN 201717033300	A	20171201	IN 2017-17033300	20170920

PRIORITY APPLN. INFO.: JP 2015-72280 A 20150331
WO 2016-JP60145 W 20160329

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2016158961	A1	Dead	20201201
CA 2979978	A1	Alive	20201121
KR 2017122823	A	Alive	20201121
KR 2000863	B1	Alive	20201120
CN 107427889	A	Alive	20201121
CN 107427889	B	Alive	20201121
MX 2017012377	A	Alive	20201121
EP 3278895	A1	Indeterminate	20201106
EP 3278895	B1	Indeterminate	20201107
BR 112017020165	A2	Alive	20201121
RU 2683397	C1	Alive	20201121
JP 6515356	B2	Alive	20201121
ES 2781465	T3	Alive	20201120
TW I597370	B	Transitional	20210701
US 20180044754	A1	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB A steel sheet for hot stamping contains, in percentage by wt., C: 0.100%-0.600%, Si: 0.50%-3.00%, Mn: 1.20%-4.00%, Ti: 0.005%-0.100%, B: 0.0005%-0.100%, P: 0.100% or less, S: 0.0001%-0.0100%, Al: 0.005%-1.000%, and N: 0.100% or less, with the remainder comprising Fe and impurities. The steel sheet surface roughness is such that Rz > 2.5 μm, and the surface is coated with 50 mg/m2-1,500 mg/m2 of oil coated thereon.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1997			JP 976004 A	
HAYASHI KUNIO	2012			WO 2012053636 A1	CAPLUS
KAWASAKI KAORU	2011			WO 2011158818 A1	CAPLUS
KOJIMA TAKESHI	2014			JP 2014159624 A	CAPLUS
KUSUMI KAZUHISA	2008			JP 2008240046 A	CAPLUS
SETO KAZUHIRO	2010			JP 2010174302 A	CAPLUS

IT 2015959-64-3P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(compn. and manuf. of carbon steel sheet suitable for hot stamping, and hot stamping molded parts)
RN 2015959-64-3 CAPLUS
CN Iron alloy, base, Fe 83-98,Mn 1.2-4,Si 0.5-3,Cr 0-2,Cu 0-2,Mo 0-2,Ni 0-2,Al 0-1,C 0.1-0.6,B 0-0.1,Nb 0-0.1,P 0-0.1,Ti 0-0.1,V 0-0.1,W 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	83 - 98	7439-89-6
Mn	1.2 - 4	7439-96-5
Si	0.5 - 3	7440-21-3
Cr	0 - 2	7440-47-3
Cu	0 - 2	7440-50-8
Mo	0 - 2	7439-98-7
Ni	0 - 2	7440-02-0
Al	0 - 1	7429-90-5
C	0.1 - 0.6	7440-44-0
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
Ti	0 - 0.1	7440-32-6
V	0 - 0.1	7440-62-2
W	0 - 0.1	7440-33-7

IPCI B21D0022-20 [I]; B21D0024-00 [I]; C21D0009-46 [I]; C22C0038-00 [I]; C22C0038-14 [I]; C22C0038-58 [I]; C23F0011-00 [I]; C23G0001-08 [I]
IPCR B21D0022-20 [I]; B21D0024-00 [I]; C21D0009-46 [I]; C22C0038-00 [I]; C22C0038-14 [I]; C22C0038-58 [I]; C23F0011-00 [I]; C23G0001-08 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST carbon steel sheet manuf hot stamping molded part
IT Adhesion, physical
Annealing
Casting of metals
Cold rolling
Hot rolling
Lubrication
Pickling
Scale (deposits)
Sheet materials
Surface roughness
Tensile strength
(compn. and manuf. of carbon steel sheet suitable for hot stamping, and hot stamping molded parts)
IT Metalworking
(stamping, hot; compn. and manuf. of carbon steel sheet suitable for hot stamping, and hot stamping molded parts)
IT 2015959-64-3P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(compn. and manuf. of carbon steel sheet suitable for hot stamping, and hot stamping molded parts)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 51 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2016:1171356 CAPLUS Full-text
DOCUMENT NUMBER: 165:381847
TITLE: Wear prediction of die coatings in strip ironing by finite element simulation
AUTHOR(S): Sabangban, N.; Mahayotsanun, N.; Sucharitpwatskul, S.; Mahabunphachai, S.
CORPORATE SOURCE: Department of Mechanical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, Thailand
SOURCE: Transactions of the IMF (2016), 94(4), 199-203
CODEN: TIRMBF
DIGITAL OBJECT ID: 10.1080/00202967.2016.1180813

PUBLISHER: Taylor & Francis Ltd.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB This study has used a simple method to predict wear of die coatings used in the strip ironing of steel sheet based on Archard's wear model by using finite element (FE) simulation. This method required the information regarding the quantity of worn material and thickness of die coatings. The die stresses obtained from the FE simulation were used to calc. the wear rate and wear depth per cycle. The die and sheet materials considered were D2 tool steel and S690QL, resp. Two types of die coatings (CrN and TiN) and their known properties were studied. The studied sliding velocities were 0.1, 1.0 and 5.0 mm s-1. The contact pressures under investigation were 15, 150 and 1500 kPa. The results showed that TiN provided higher wear resistance due to its lower quantity of worn material (1.962 × 10-16 m3). The total wear depth per cycle increased with reducing quantity of worn material (increasing hardness value). Increase in sliding velocity led to increase in wear depth per cycle. The contact pressure (15-1500 kPa) did not significantly affect wear depth per cycle. To illustrate the acquired wear depth per cycle of all the coatings under different conditions, a predictive wear map was developed. In addn., the no. of operating cycles based on the die coating thickness could be calcd. Based on the findings, the wear map could be used to help select appropriate die coatings and adjust process parameters in order to extend die service life.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Adamovic, D	2010	17	435	Tech Gazette	
Archard, J	1953	24	981	J Appl Phys	
Bortoleto, E	2013	301	19	Wear	CAPLUS
Chen, J	2006	132	1948	J Struct Eng	
Clarysse, F	2008	264	400	Wear	CAPLUS
Cora, A	2012	52	50	Tribol Int	
Ehiasarian, A	2004	457	270	Thin Solid Films	CAPLUS
Eriksson, J	2011	205	4045	Surf Coat Technol	CAPLUS
Ghiotti, A	2011	271	2454	Wear	CAPLUS
Groche, P	2005	6-8	93	Adv Mater Res	
Holmberg, K	2007	202	1034	Surf Coat Technol	CAPLUS
Kang, J	1999	94	183	J Mater Process Tech	
Kang, J	1999	96	53	J Mater Process Tech	
Kim, H	2008	57	299	CIRP Ann Manuf Techn	
Kim, H	2009	209	4122	J Mater Process Tech	CAPLUS
Kuziak, R	2008	8	103	Arch Civil Mech Eng	
Liu, R	2001	251	956	Wear	
Lugscheider, E	2004	177-1	616	Surf Coat Technol	CAPLUS
Mori, H	2002	149	224	Surf Coat Technol	CAPLUS
Osakada, K	2000	49	161	CIRP Ann-Manuf Techn	
Pan, W	1998	110	111	Surf Coat Technol	CAPLUS
Podgornik, B	2004	184	338	Surf Coat Technol	CAPLUS
Podgornik, B	2006	261	15	Wear	CAPLUS
Rupert, T	2010	58	4137	Acta Mater	CAPLUS
Schedin, E	1993	14	127	Mater Des	
Severo, V	2009	209	4662	J Mater Process Tech	CAPLUS
Sresomroeng, B	2010	19	833	Diam Relat Mater	CAPLUS
Sresomroeng, B	2011	205	4198	Surf Coat Technol	CAPLUS
Wang, C	2013	213	323	J Mater Process Tech	CAPLUS
Wang, Z	2001	113	705	J Mater Process Tech	

IT 12604-89-6, S690QL, properties
RL: PRP (Properties)
(wear prediction of die coatings in strip ironing by finite element simulation)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3

Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-2 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST die coating chromium titanium nitride steel FEM
IT Coating materials
(abrasion-resistant; wear prediction of die coatings in strip ironing by finite element simulation)
IT Abrasion-resistant materials
(coatings; wear prediction of die coatings in strip ironing by finite element simulation)
IT Dies
Finite element method
Vickers hardness
Wear resistance
(wear prediction of die coatings in strip ironing by finite element simulation)
IT 12604-89-6, S690QL, properties 172399-17-6, properties
RL: PRP (Properties)
(wear prediction of die coatings in strip ironing by finite element simulation)
IT 24094-93-7, Chromium nitride (CrN) 25583-20-4, Titanium nitride (TiN)
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(wear prediction of die coatings in strip ironing by finite element simulation)

L15 ANSWER 52 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:1942164 CAPLUS Full-text
DOCUMENT NUMBER: 164:40753
TITLE: Steel sheet provided with a sacrificial cathodically protected coating comprising lanthanum
INVENTOR(S): Allely, Christian; Petitjean, Jacques
PATENT ASSIGNEE(S): ArcelorMittal Investigacion y Desarrollo, S.L., Spain
SOURCE: PCT Int. Appl., 20pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2015181581	A1	20151203	WO 2014-IB61788	20140528
CA 2950476	A1	20151203	CA 2015-2950476	20150528
WO 2015181318	A1	20151203	WO 2015-EP61891	20150528
KR 2017010773	A	20170201	KR 2016-7032934	20150528
CN 106460138	A	20170222	CN 2015-80027730	20150528
EP 3149217	A1	20170405	EP 2015-724718	20150528
EP 3149217	B1	20180711		
JP 2017524806	T	20170831	JP 2016-569819	20150528
JP 6762879	B2	20200930		
ES 2689039	T3	20181108	ES 2015-724718	20150528
RU 2689979	C2	20190530	RU 2016-146657	20150528
BR 112016027581	B1	20210223	BR 2016-112016027581	20150528
ZA 2016007435	A	20171220	ZA 2016-7435	20161027
IN 201617039713	A	20170310	IN 2016-17039713	20161121
IN 343260	B	20200804		
MX 2016015550	A	20170425	MX 2016-15550	20161125
US 20170198374	A1	20170713	US 2016-15314457	20161128
US 10676804	B2	20200609		

PRIORITY APPLN. INFO.:
WO 2014-IB61788 A 20140528
WO 2015-EP61891 W 20150528

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2015181581	A1	Dead	20201202

```
     CA 2950476          A1   Alive          20201121
     WO 2015181318       A1   Dead           20201202
     KR 2017010773       A    Transitional   20210826
     CN 106460138        A    Alive          20201120
     EP 3149217          A1   Indeterminate  20201107
     EP 3149217          B1   Indeterminate  20201106
     JP 6762879          B2   Alive          20201121
     ES 2689039          T3   Alive          20201120
     RU 2689979          C2   Alive          20201120
     BR 112016027581     B1   Alive          20210325
     MX 2016015550       A    Alive          20201121
     US 20170198374      A1   Alive          20201120
     US 10676804         B2   Alive          20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The invention relates to a steel sheet provided with a sacrificial
     cathodically protected coating comprising between 1 and 40 % by wt.
     zinc, between 0.01 and 0.4 % by wt. lanthanum, and optionally up to 10 %
     by wt. magnesium, optionally up to 15 % by wt. silicon, and optionally up
     to 0.3 % by wt., in cumulative amts., of addnl. components, the remainder
     consisting of aluminum and unavoidable impurities or residual elements.
     The invention also relates to a method of producing parts by hot or cold
     swaging and the parts which can be obtained in this way.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
LIXIN FENG             |2010 |     |      |CN 101736217 A      |CAPLUS
MORIMOTO YASUHIDE      |2009 |     |      |JP 2009120942 A     |CAPLUS
NOSE KOICHI            |2008 |     |      |EP 1997927 A1       |CAPLUS
ZHAO YUNJIE            |2013 |     |      |CN 103045980 A      |CAPLUS
IT   1173986-65-6
     RL: NUU (Other use, unclassified); USES (Uses)
        (steel sheet provided with sacrificial cathodically protected
        coating comprising lanthanum)
RN   1173986-65-6  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti
     0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      94   -  99       7439-89-6
    Mn       0.5 -   3       7439-96-5
    Cr       0   -   1       7440-47-3
    C        0.2 -   0.5     7440-44-0
    Si       0.1 -   0.5     7440-21-3
    Ti       0   -   0.2     7440-32-6
    Al       0   -   0.1     7429-90-5
    B        0   -   0.1     7440-42-8
    Cu       0   -   0.1     7440-50-8
    Ni       0   -   0.1     7440-02-0
    P        0   -   0.1     7723-14-0

IPCI C23C0002-12 [I]; C22C0021-10 [I]
IPCR C23C0002-12 [I]; C22C0021-10 [I]
CC   56-3 (Nonferrous Metals and Alloys)
ST   steel sheet sacrificial cathodically protected coating lanthanum swaging
IT   Anticorrosive coating materials
       Coating process
     Swaging
        (steel sheet provided with sacrificial cathodically protected
        coating comprising lanthanum)
IT   7439-91-0, Lanthanum, uses
     RL: MOA (Modifier or additive use); USES (Uses)
        (steel sheet provided with sacrificial cathodically protected
        coating comprising lanthanum)
IT   12597-69-2, Steel, uses   1173986-65-6
     RL: NUU (Other use, unclassified); USES (Uses)
        (steel sheet provided with sacrificial cathodically protected
        coating comprising lanthanum)
IT   1832643-11-4
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
```

(Technical or engineered material use); PROC (Process); USES (Uses)
(steel sheet provided with sacrificial cathodically protected coating comprising lanthanum)

L15 ANSWER 53 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:1942163 CAPLUS Full-text
DOCUMENT NUMBER: 164:40752
TITLE: Steel sheet provided with a sacrificial cathodically protected coating comprising lanthanum
INVENTOR(S): Allely, Christian; Petitjean, Jacques
PATENT ASSIGNEE(S): ArcelorMittal, Luxembourg
SOURCE: PCT Int. Appl., 21pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2015181318	A1	20151203	WO 2015-EP61891	20150528
WO 2015181581	A1	20151203	WO 2014-IB61788	20140528
CA 2950476	A1	20151203	CA 2015-2950476	20150528
KR 2017010773	A	20170201	KR 2016-7032934	20150528
CN 106460138	A	20170222	CN 2015-80027730	20150528
EP 3149217	A1	20170405	EP 2015-724718	20150528
EP 3149217	B1	20180711		
JP 2017524806	T	20170831	JP 2016-569819	20150528
JP 6762879	B2	20200930		
ES 2689039	T3	20181108	ES 2015-724718	20150528
RU 2689979	C2	20190530	RU 2016-146657	20150528
BR 112016027581	B1	20210223	BR 2016-112016027581	20150528
IN 201617039713	A	20170310	IN 2016-17039713	20161121
IN 343260	B	20200804		
MX 2016015550	A	20170425	MX 2016-15550	20161125
US 20170198374	A1	20170713	US 2016-15314457	20161128
US 10676804	B2	20200609		

PRIORITY APPLN. INFO.: WO 2014-IB61788 A 20140528
WO 2015-EP61891 W 20150528

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2015181318	A1	Dead	20201202
WO 2015181581	A1	Dead	20201202
CA 2950476	A1	Alive	20201121
KR 2017010773	A	Transitional	20210826
CN 106460138	A	Alive	20201120
EP 3149217	A1	Indeterminate	20201107
EP 3149217	B1	Indeterminate	20201106
JP 6762879	B2	Alive	20201121
ES 2689039	T3	Alive	20201120
RU 2689979	C2	Alive	20201120
BR 112016027581	B1	Alive	20210325
MX 2016015550	A	Alive	20201121
US 20170198374	A1	Alive	20201120
US 10676804	B2	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The invention relates to a steel sheet provided with a sacrificial cathodically protected coating comprising between 1 and 40 % by wt. zinc, between 0.01 and 0.4 % by wt. lanthanum, and optionally up to 10 % by wt. magnesium, optionally up to 15 % by wt. silicon, and optionally up to 0.3 % by wt., in cumulative amts., of addnl. components, the remainder consisting of aluminum and unavoidable impurities or residual elements. The invention also relates to a method of producing parts by hot or cold swaging and the parts which can be obtained in this way.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
LIXIN PENG	2010			CN 101736217 A	CAPLUS
MORIMOTO YASUHIDE	2009			JP 2009120942 A	CAPLUS
NOSE KOICHI	2008			EP 1997927 A1	CAPLUS

ZHAO YUNJIE |2013 | | |CN 103045980 A |CAPLUS
IT 1173986-65-6
RL: NUU (Other use, unclassified); USES (Uses)
(steel sheet provided with sacrificial cathodically protected coating comprising lanthanum)
RN 1173986-65-6 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Cu	0 - 0.1	7440-50-8
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0

IPCI C23C0002-12 [I]; C22C0021-10 [I]
IPCR C23C0002-12 [I]; C22C0021-10 [I]
CC 56-3 (Nonferrous Metals and Alloys)
ST steel sheet sacrificial cathodically protected coating swaging
IT Anticorrosive coating materials
Coating process
(steel sheet provided with sacrificial cathodically protected coating comprising lanthanum)
IT 12597-69-2, Steel, uses 1173986-65-6
RL: NUU (Other use, unclassified); USES (Uses)
(steel sheet provided with sacrificial cathodically protected coating comprising lanthanum)
IT 1832625-87-2
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel sheet provided with sacrificial cathodically protected coating comprising lanthanum)

L15 ANSWER 54 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:1466750 CAPLUS Full-text
DOCUMENT NUMBER: 175:345485
TITLE: Stress build-up in HSLA steel welds due to material behaviour
AUTHOR(S): Schroepfer, Dirk; Kannengiesser, Thomas
CORPORATE SOURCE: BAM Federal Institute for Materials Research and Testing, Berlin, 12205, Germany
SOURCE: Journal of Materials Processing Technology (2016), 227, 49-58
CODEN: JMPTEF; ISSN: 0924-0136
DIGITAL OBJECT ID: 10.1016/j.jmatprotec.2015.08.003
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB For the performance of high-strength steel welds by means of load bearing capacity and safety, the information about stress level and distribution due to welding is needed. The interaction between the filler material grade (strength) and heat input on the reaction stresses in high-strength steels, welded under defined restraint conditions were analyzed. Butt welds were joined by a multilayer GMAW process in the Instrumented Restraint Cracking test facility (IRC-test). This test facility allowed a defined restraint and, simultaneously, an in-situ anal. of the reaction stresses while welding and cooling. The reaction force build-up of the weld tests showed a significant influence of the used filler materials according to the heat input. Higher strength filler material grades cause a decrease of the welding stresses compared to lower strength grades, if a low heat input is used. The different stress build-up is described in detail for the root welds, filler layers and

subsequent cooling to ambient temp. Residual stresses in the weld, HAZ and base material were measured in loaded and unloaded condition using the incremental hole drilling method.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				N.N., 2008. Developm	
Badji, R	2008	59	447	Mater Charact, 10.10	CAPLUS
Bhadeshia, H	2004	378	34	Mater Sci Eng A, 10.	CAPLUS
Boellinghaus, T	2003		906	6th International Tr	CAPLUS
Dai, H	2008	39	3070	Metall Mater Trans A	CAPLUS
Dong, P	2005	82	258	Int J Press Vessels	
Hara, N	2009			Conference on High S	
Heuser, H	2007	38	515	Materwiss Werksttech	CAPLUS
Hulka, K	2005	500-5	519	Mater Sci Forum, 10.	CAPLUS
Kannengiesser, T	2011	55	58	Weld World, 10.1007/	CAPLUS
Lachmann, C	1997		287	Investigations on th	
Lausch, T	2013	213	1234	J Mater Process Tech	CAPLUS
Leggatt, R	2008	85	144	Press Vessels Pip, 1	CAPLUS
Loureiro, A	2002	128	240	J Mater Process Tech	CAPLUS
Maltrud, F	2009	23	60	Weld Int, 10.1080/09	
Rauch, R	2012			BHM Berg- und Hutten	CAPLUS
Satoh, K	1977	15	155	Weld World	
Schroepfer, D	2015			Weld World, 10.1007/	CAPLUS
Stoschka, M	2012	56	20	Weld World, 10.1007/	CAPLUS
Umekuni, A	1997	76	256	Weld J	
Uwer, D	1992	38	31	Weld Res Abroad	
Withers, P	2001	17	366	Mater Sci Technol, 1	CAPLUS
Zrilic, M	2007	84	139	Int J Press Vessels	CAPLUS

IT 186511-13-7, S690Q
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(stress build-up in HSLA steel welds due to material behavior)

RN 186511-13-7 CAPLUS

CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8931) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 100	7439-89-6
Mn	0 - 1.70	7439-96-5
Ni	0 - 1.50	7440-02-0
Cr	0 - 1.00	7440-47-3
Si	0.15 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
Cu	0 - 0.50	7440-50-8
C	0 - 0.20	7440-44-0
V	0 - 0.12	7440-62-2
Nb	0 - 0.05	7440-03-1
P	0 - 0.025	7723-14-0
S	0 - 0.025	7704-34-9
B	0 - 0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)

ST steel weld material residual stress tensile strength

IT Welding of metals
(gas metal-arc welding; stress build-up in HSLA steel welds due to material behavior)

IT Butt welds
Mechanical contraction
Metal welding fillers
Residual stress
Structural phase transition
(stress build-up in HSLA steel welds due to material behavior)

IT Tensile strength
(ultimate; stress build-up in HSLA steel welds due to material behavior)

IT 12173-93-2, Martensite, processes 12427-23-5, Bainite 12427-24-6, Ferrite (ferrous metal component)
RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); FORM (Formation, nonpreparative); PROC (Process)
(stress build-up in HSLA steel welds due to material behavior)
IT 186511-13-7, S690Q 1311295-84-7, G22-9-3NL 1865734-43-5, Mn4Ni2.5CrMo 1865734-44-6, Mn4Ni1.5CrMo
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(stress build-up in HSLA steel welds due to material behavior)
OS.CITING REF COUNT: 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD (8 CITINGS)

L15 ANSWER 55 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:678585 CAPLUS Full-text
DOCUMENT NUMBER: 164:292493
TITLE: Coatings by arc spraying of nanocrystalline metallic wires on carbon steel surfaces: surface hardness, hydrophobicity, and residual stress
AUTHOR(S): Yilbas, B. Sami; Bhushan, B.; Abdul Aleem, B. J.; Al Askandarani, A.
CORPORATE SOURCE: Department of Mechanical Engineering, King Fahd University of Petroleum and Minerals, Dhahran, 31261, Saudi Arabia
SOURCE: Canadian Metallurgical Quarterly (2015), 54(4), 415-423
CODEN: CAMQAU; ISSN: 0008-4433
DIGITAL OBJECT ID: 10.1179/1879139515Y.0000000010
PUBLISHER: Maney Publishing
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Wire arc spraying of two different metallic wires composed of nanocryst. and amorphous phases onto carbon steel sheets is carried out. Coating characteristics, including morphol. and metallurgical changes, microhardness, residual stress, and surface hydrophobicity are examd. using anal. tools. It is found that microhardness increases in the surface region of the coating because of oxidn. and high cooling rates. Nanoparticles in the coating act like grain arresting centers contributing to higher residual stress levels. The surface texture of the coating, composed of micro/nanopores, enhances surface hydrophobicity. The coating produced by the 140MXC wire has higher surface hardness than that of the 95MXC wire, resulting in a correspondingly lower friction in the 140MXC wire. However, the residual stress formed in the coating is higher for 140MXC wire than that corresponding to 95MXC wire. In addn., both coatings produced by two different wire sprayings have similar hydrophobic characteristics at the surface.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Al Askandarani, A	2012	445	803	14th International C	
Al Askandarani, A	2010	1315	1383	Advances in Material	CAPLUS
Anon	2014			http://tatiscia.com/	
Anon	2014			http://www.praxairsu	
Anon	2014			www.praxair.com/prax	
Bhushan, B	2012			Biomimetics:bioinspi	
Bhushan, B	1991			Handbook of tribolog	
Branagan, D	2005	14	196	J Therm Spray Techno	
Cassie, A	1944	40	546	Trans Faraday Soc	CAPLUS
Gedzevicius, I	2006	175	206	J Mater Process Tech	CAPLUS
Georgieva, P	2006	164	18	Adv Mater Process	
Guo, W	2014			J Therm Spray Techno	
Heuberger, A	2004	3	356	Weld Cutting	
Hussary, N	2001	10	604	J Therm Spray Techno	CAPLUS
Khan, R	2005	200	1580	Surf Coat Technol	CAPLUS
Madaeni, S	2008	320	541	J Membr Sci	CAPLUS
Miao, P	2007	36	1197	J Nucl Mater	
Tillmann, W	2013	22	352	J Therm Spray Techno	CAPLUS

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Toma, S                 |2013 |220  |266   |Surf Coat Technol   |CAPLUS
Wenzel, R               |1936 |28   |988   |Ind Eng Chem        |CAPLUS
Zan, H                  |2007 |8    |450   |Org Electron        |CAPLUS
Zhu, Y                  |2003 |162  |301   |Surf Coat Technol   |CAPLUS
IT   916826-46-5, 140MXC
     RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);
     TEM (Technical or engineered material use); PROC (Process); USES (Uses)
        (coating wire; coatings by arc spraying of
        nanocryst. metallic wires on carbon steel surfaces: surface
        hardness, hydrophobicity, and residual stress)
RN   916826-46-5  CAPLUS
CN   Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC)  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+=============+===============
    Fe       0  -  40        7439-89-6
    Cr       0  -  20        7440-47-3
    Mo       0  -  10        7439-98-7
    Nb       0  -   9        7440-03-1
    W        0  -   9        7440-33-7
    B        0  -   5        7440-42-8
    Mn       0  -   5        7439-96-5
    C        0  -   4        7440-44-0
    Si       0  -   2        7440-21-3

CC   55-6 (Ferrous Metals and Alloys)
ST   steel nanocryst arc spraying coating hardness hydrophobicity residual
     stress
IT   Amorphous structure
     Arc spray coating process
       Coating materials
     Friction
     Hydrophobicity
     Microhardness
     Microstructure
     Oxidation resistance
     Residual stress
     Surface structure
        (coatings by arc spraying of nanocryst. metallic wires on
        carbon steel surfaces: surface hardness, hydrophobicity, and
        residual stress)
IT   Nanocrystalline metals
     RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);
     TEM (Technical or engineered material use); PROC (Process); USES (Uses)
        (coatings by arc spraying of nanocryst. metallic wires on
        carbon steel surfaces: surface hardness, hydrophobicity, and
        residual stress)
IT   198574-15-1, 95MXC   916826-46-5, 140MXC
     RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);
     TEM (Technical or engineered material use); PROC (Process); USES (Uses)
        (coating wire; coatings by arc spraying of
        nanocryst. metallic wires on carbon steel surfaces: surface
        hardness, hydrophobicity, and residual stress)
IT   11121-90-7, Carbon steel, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (coatings by arc spraying of nanocryst. metallic wires on
        carbon steel surfaces: surface hardness, hydrophobicity, and
        residual stress)


L15  ANSWER 56 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2015:672724  CAPLUS Full-text
DOCUMENT NUMBER:         163:706662
TITLE:                   Application of the Incremental Hole-Drilling Method on
                         Thick Film Systems-An Approximate Evaluation Approach
AUTHOR(S):               Held, E.; Gibmeier, J.
CORPORATE SOURCE:        Institute for Applied Materials, Karlsruhe Institute
                         of Technology, Karlsruhe, D-76131, Germany
SOURCE:                  Experimental Mechanics (2015), 55(3), 499-507
                         CODEN: EXMCAZ; ISSN: 0014-4851
```

DIGITAL OBJECT ID: 10.1007/s11340-014-9962-3
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB A new evaluation procedure is presented regarding the application of the incremental hole-drilling technique to det. in-depth residual stress distribution in thick film systems. Using a direct correction of the measured strain relaxation, obtained after each incremental depth, to take into account the effect of the layered structure of the material, the std. evaluation procedures can still be used without any further modification. For example, the standardized integral method uses specific geometrical calibration consts., which are only valid for isotropic, homogeneous and linear elastic materials. Using artificial neural networks, for the prediction of the correction function to be applied to the measured strain relaxation in thick layered systems, the std. integral method can still be applied. The validation of the proposed approach is shown using finite element (FE-) simulations. In addn., the new evaluation strategy is applied for residual stress detn. in a thermally sprayed Aluminum oxide coating on a steel (S690QL) substrate.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				ASTM E837-13a (o J.)	
Anon				H-DRILL Hole-Drillin	
Anon				Hagan MT, Demuth HB,	
Anon				Held E (2013) Eigens	
Anon				MathWorks Deutschlan	
Anon				Schwarz T (1996) Bei	
Buchmann, M	2000	288	154	Mat Sci Eng A, 10.10	
Clyne, T	1996	5	401	J Therm Spray Tech,	CAPLUS
Dario, V	1997	119	79	J Eng Mater Technol,	
Eigenmann, B	1995	26	148	Materialwiss Werkst,	CAPLUS
Eigenmann, B	1996	27	491	Materialwiss Werksto	CAPLUS
Eigenmann, B	1996	27	426	Teil III Materialwis	CAPLUS
Held, E	2014	69	71	J Heat Treat Mater,	
Macherauch, E	1961	13	340	Z Angew Phys	
Montay, G	2002	155	152	Surf Coat Tech, 10.1	CAPLUS
Niku-Lari, A	1985	11	167	J Mech Work Technol,	
Obelode, E	2013	53	965	Exp Mech, 10.1007/s1	
Obelode, E	2014	68-76	136	Mat Sci Forum, 10.40	
Patterson, D	1997			Kunstliche neuronale	
Perry, A	1996	81	17	Surf Coat Tech, 10.1	CAPLUS
Santana, Y	2008	202	4560	Surf Coat Tech, 10.1	CAPLUS
Schajer, G	1988	110	338	J Eng Mater Tech, 10	
Schajer, G	1988	110	344	Method J Eng Mater T	
Schwarz, T	1993	29	33	Messtechnische Brief	
Stefanescu, D	2006	46	417	Exp Mech, 10.1007/s1	
Valente, T	2005	14	462	J Therm Spray Tech,	
Wenzelburger, M	2006	201	1995	Surf Coat Tech, 10.1	CAPLUS

IT 12604-89-6, S690QL, processes
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(substrate; application of the Incremental Hole-Drilling Method on Thick Film Systems-An Approx. Evaluation Approach)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-11 (Ferrous Metals and Alloys)
ST drilling alumina steel coating thermal spraying FEM ANN stress
IT Coating materials
Drilling
Finite element method
Microstructure
Neural network modeling
Residual stress
Strain
Stress, mechanical
Thermal spray coating process
(application of the Incremental Hole-Drilling Method on Thick Film Systems-An Approx. Evaluation Approach)
IT 1344-28-1, Alumina, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; application of the Incremental Hole-Drilling Method on Thick Film Systems-An Approx. Evaluation Approach)
IT 12604-89-6, S690QL, processes
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(substrate; application of the Incremental Hole-Drilling Method on Thick Film Systems-An Approx. Evaluation Approach)
OS.CITING REF COUNT: 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

L15 ANSWER 57 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:512917 CAPLUS Full-text
DOCUMENT NUMBER: 162:428426
TITLE: Metal powder for powder-based production processes and method for production of a metallic component from metal powder
INVENTOR(S): Fechte-Heinen, Rainer; Mayer, Stefan; Offergeld, Andreas; Patberg, Lothar; Cott, Andreas
PATENT ASSIGNEE(S): ThyssenKrupp Steel Europe AG, Germany
SOURCE: Ger. Offen., 7pp.; Chemical Indexing Equivalent to 162:428425 (WO)
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102013110417	A1	20150326	DE 2013-102013110417	20130920
WO 2015039986	A2	20150326	WO 2014-EP69603	20140915
WO 2015039986	A3	20150827		
EP 3046704	A2	20160727	EP 2014-771830	20140915
PRIORITY APPLN. INFO.:			DE 2013-102013110417 A	20130920
			WO 2014-EP69603 W	20140915

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102013110417	A1	Alive	20201121
WO 2015039986	A2	Dead	20201202
WO 2015039986	A3	Dead	20201202
EP 3046704	A2	Alive	20201202

AB The invention relates to metal powder for powder-based prodn. processes wherein a component is structured in layers or as a compact green body from metal powder and is strengthened by welding or sintering. In order that such a metal powder is easily weldable and can be cost-effectively produced, and is thus in particular suitable for fast, economically efficient prodn. of functional components in large quantities in an additive prodn. process (rapid manufg.), the metal powder according to the invention has a particle size distribution in the range of 5 - 150 μm and contains primarily iron and unavoidable impurities, wherein the iron proportion thereof is in the range from 89.6 to 99.9 wt.%. The invention further relates to the use of such a metal powder (steel powder) for powder-based prodn. processes and a method for producing a metallic component through layered structuring and welding or sintering using such a metal powder.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				DE 10039144 C1	CAPLUS
Anon				WO 2011152774 A1	CAPLUS

IT 1674360-61-2P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(metal powder for powder-based prodn. processes and method for prodn. of metallic component from metal powder)
RN 1674360-61-2 CAPLUS
CN Iron alloy, base, Fe 90-100,Mn 0-3.8,Si 0-1,Cu 0-0.7,Mo 0-0.6,C 0-0.5,Cr 0-0.4,Ni 0-0.4,Ti 0-0.3,Co 0-0.2,Nb 0-0.2,P 0-0.2,V 0-0.2,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	90 - 100	7439-89-6
Mn	0 - 3.8	7439-96-5
Si	0 - 1	7440-21-3
Cu	0 - 0.7	7440-50-8
Mo	0 - 0.6	7439-98-7
C	0 - 0.5	7440-44-0
Cr	0 - 0.4	7440-47-3
Ni	0 - 0.4	7440-02-0
Ti	0 - 0.3	7440-32-6
Co	0 - 0.2	7440-48-4
Nb	0 - 0.2	7440-03-1
P	0 - 0.2	7723-14-0
V	0 - 0.2	7440-62-2
B	0 - 0.1	7440-42-8

IPCI B22F0003-10 [I]
IPCR B22F0003-10 [I]
CC 55-4 (Ferrous Metals and Alloys)
ST steel powder metallurgy sintering welding mech property
IT 1674360-61-2P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(metal powder for powder-based prodn. processes and method for prodn. of metallic component from metal powder)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 58 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2015:512916 CAPLUS Full-text
DOCUMENT NUMBER: 162:428425
TITLE: Metal powder for powder-based production processes and method for production of a metallic component from metal powder
INVENTOR(S): Fechte-Heinen, Rainer; Mayer, Stefan; Offergeld, Andreas; Patberg, Lothar; Cott, Andreas
PATENT ASSIGNEE(S): ThyssenKrupp Steel Europe AG, Germany
SOURCE: PCT Int. Appl., 16pp.; Chemical Indexing Equivalent to 162:428426 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2015039986	A2	20150326	WO 2014-EP69603	20140915
WO 2015039986	A3	20150827		
DE 102013110417	A1	20150326	DE 2013-102013110417	20130920
EP 3046704	A2	20160727	EP 2014-771830	20140915
PRIORITY APPLN. INFO.:			DE 2013-102013110417 A	20130920
			WO 2014-EP69603 W	20140915

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2015039986	A2	Dead	20201202
WO 2015039986	A3	Dead	20201202
DE 102013110417	A1	Alive	20201121
EP 3046704	A2	Alive	20201202

AB The invention relates to metal powder for powder-based prodn. processes wherein a component is structured in layers or as a compact green body from metal powder and is strengthened by welding or sintering. In order that such a metal powder is easily weldable and can be cost-effectively produced, and is thus in particular suitable for fast, economically efficient prodn. of functional components in large quantities in an additive prodn. process (rapid manufg.), the metal powder according to the invention has a particle size distribution in the range of 5 - 150 μm and contains primarily iron and unavoidable impurities, wherein the iron proportion thereof is in the range from 89.6 to 99.9 wt.%. The invention further relates to the use of such a metal powder (steel powder) for powder-based prodn. processes and a method for producing a metallic component through layered structuring and welding or sintering using such a metal powder.

IT 1674360-61-2P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(metal powder for powder-based prodn. processes and method for prodn. of metallic component from metal powder)

RN 1674360-61-2 CAPLUS

CN Iron alloy, base, Fe 90-100,Mn 0-3.8,Si 0-1,Cu 0-0.7,Mo 0-0.6,C 0-0.5,Cr 0-0.4,Ni 0-0.4,Ti 0-0.3,Co 0-0.2,Nb 0-0.2,P 0-0.2,V 0-0.2,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	90 - 100	7439-89-6
Mn	0 - 3.8	7439-96-5
Si	0 - 1	7440-21-3
Cu	0 - 0.7	7440-50-8
Mo	0 - 0.6	7439-98-7
C	0 - 0.5	7440-44-0
Cr	0 - 0.4	7440-47-3
Ni	0 - 0.4	7440-02-0
Ti	0 - 0.3	7440-32-6
Co	0 - 0.2	7440-48-4
Nb	0 - 0.2	7440-03-1
P	0 - 0.2	7723-14-0
V	0 - 0.2	7440-62-2
B	0 - 0.1	7440-42-8

IPCI B22F0007-02 [I]; B22F0007-02 [I]; C22C0033-02 [I]
IPCR B22F0007-02 [I]; C22C0033-02 [I]
CC 55-4 (Ferrous Metals and Alloys)
ST steel powder metallurgy sintering welding mech property
IT 1674360-61-2P
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(metal powder for powder-based prodn. processes and method for prodn. of metallic component from metal powder)

L15 ANSWER 59 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:2105582 CAPLUS Full-text
DOCUMENT NUMBER: 162:84344
TITLE: Method for hot forming a zinc or zinc alloy coated strip, sheet or blank
INVENTOR(S): Hensen, Guido Cornelis; Verloop, Willem Cornelis; Neelis, Bastiaan Maarten
PATENT ASSIGNEE(S): Tata Steel IJmuiden B.V., Neth.
SOURCE: PCT Int. Appl., 22 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014198399	A2	20141218	WO 2014-EP1540	20140606
WO 2014198399	A3	20150226		
PRIORITY APPLN. INFO.:			EP 2013-3043 A	20130614
			EP 2013-4166 A	20130823

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2014198399	A2	Dead	20201202
WO 2014198399	A3	Dead	20201202

AB The invention relates to a method for hot forming a strip, sheet or blank coated with a zinc or zinc based alloy layer to form a hot formed product. According to the invention a no. of specific steps are taken to perform this method within certain limits. The invention also relates to the hot formed product produced using this method.

IT 1639926-81-0
RL: NUU (Other use, unclassified); USES (Uses)
(substrate; method for hot forming zinc or zinc alloy coated strip, sheet or blank)

RN 1639926-81-0 CAPLUS

CN Iron alloy, base, Fe 87-99,Mn 0.5-3.5,W 0-3,Nb 0-2,V 0-2,Cr 0-1,Si 0.1-0.8,C 0.1-0.5,Al 0-0.2,Ti 0-0.2,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	87	-	99	7439-89-6
Mn	0.5	-	3.5	7439-96-5
W	0	-	3	7440-33-7
Nb	0	-	2	7440-03-1
V	0	-	2	7440-62-2
Cr	0	-	1	7440-47-3
Si	0.1	-	0.8	7440-21-3
C	0.1	-	0.5	7440-44-0
Al	0	-	0.2	7429-90-5
Ti	0	-	0.2	7440-32-6
B	0	-	0.1	7440-42-8
P	0	-	0.1	7723-14-0

IPCI C22F0001-16 [I]; C23C0002-06 [I]; C23C0002-26 [I]; C23C0002-28 [I]; C23C0002-40 [I]; C21D0001-673 [I]; C23C0028-00 [I]

IPCR C23C0002-06 [I]; C21D0001-673 [I]; C23C0002-26 [I]; C23C0002-28 [I]; C23C0002-40 [I]; C23C0028-00 [I]

CC 56-6 (Nonferrous Metals and Alloys)

ST steel zinc alloy anticorrosive coating electroplating

IT Anticorrosive coating materials
Electrodeposition
Mechanical hardness
(method for hot forming zinc or zinc alloy coated strip, sheet or blank)

IT 7440-66-6, Zinc, processes 1273147-93-5, Zinc alloy
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for hot forming zinc or zinc alloy coated strip, sheet or blank)

IT 870820-47-6, 22MnB5 1639926-81-0
RL: NUU (Other use, unclassified); USES (Uses)
(substrate; method for hot forming zinc or zinc alloy coated strip, sheet or blank)

L15 ANSWER 60 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2014:1956673 CAPLUS Full-text

DOCUMENT NUMBER: 164:498294

TITLE: Formation of Nanostructures in Severely Deformed High-Strength Steel Induced by High-Frequency Ultrasonic Impact Treatment

AUTHOR(S): Dutta, R. K.; Malet, L.; Gao, H.; Hermans, M. J. M.; Godet, S.; Richardson, I. M.

CORPORATE SOURCE: Materials innovation institute M2i, Delft, 2628 CD,

Neth.
SOURCE: Metallurgical and Materials Transactions A: Physical Metallurgy and Materials Science (2015), 46(2), 813-830
CODEN: MMTAEB; ISSN: 1073-5623
DIGITAL OBJECT ID: 10.1007/s11661-014-2658-6
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Surface modification by the generation of a nanostructured surface layer induced via ultrasonic impact treatment was performed at the weld toe of a welded high-strength quenched and tempered structural steel, S690QL1 (Fe-0.16C-0.2Si-0.87Mn-0.33Cr-0.21Mo (wt pct)). Such high-frequency peening techniques are known to improve the fatigue life of welded components. The nanocrystd. structure as a function of depth from the top-treated surface was characterized via a recently developed automated crystal orientation mapping in transmission electron microscopy. Based on the exptl. observations, a grain refinement mechanism induced by plastic deformation during the ultrasonic impact treatment is proposed. It involves the formation of low-angle misoriented lamellae displaying a high d. of dislocations followed by the subdivision of microbands into blocks and the resulting formation of polygonal submicronic grains. These submicronic grains further breakdown into nano grains. The results show the presence of retained austenite even after severe surface plastic deformation. The av. grain size of the retained austenite and martensite is ~ 17 and ~ 35 nm, resp. The in-grain deformation mechanisms are different in larger and smaller grains. Larger grains show long-range lattice rotations, while smaller grains show plastic deformation through grain rotation. Also the smaller nano grains exhibit the presence of short-range disorder. Surface nanocrystn. also leads to an increased fraction of low angle and low energy coincident site lattice boundaries esp. in the smaller grains (D < 50 nm).

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Albou, A	2013	68	400	Scripta Mater, 10.10	CAPLUS
Ananthan, V	1991	7	1069	Mater Sci Technol, 1	CAPLUS
Anon				A.P Sutton and R.W B	
Anon				B Bay, N Hansen, and	
Anon				D.G Morris:Mechanica	
Anon				E.S Statnikov, V.O M	
Anon				E.S Statnikov, V.O M	
Anon				E.S Statnikov:Intern	
Anon				I.M Mikhailovskij, T	
Anon				J.F Flavenot and J L	
Anon				J.R Bowen:Ph.D Thesi	
Anon				M Nave:Personal Comm	
Anon				R.T DeHoff and F.N R	
Anon				S.J Fensin, E.K Cerr	
Barbier, D	2009	500	196	Mater Sci Eng A, 10.	CAPLUS
Belyakov, A	2001	81	2629	Philos Mag A, 10.108	CAPLUS
Brandon, D	1966	14	1479	Acta Metall, 10.1016	
Cao, S	2005	392	203	Mater Sci Eng A, 10.	CAPLUS
Cao, S	2005	52	25	Scripta Mater, 10.10	CAPLUS
Carpenter, J	2012	67	336	Scripta Mater, 10.10	CAPLUS
Cerreta, E	2012	66	638	Scripta Mater, 10.10	CAPLUS
Chatterjee, S	2006	22	641	Mater Sci Technol, 1	CAPLUS
Dai, K	2007	463	46	Mater Sci Eng A, 10.	CAPLUS
Derby, B	1991	39	955	Acta Metall Mater, 1	CAPLUS
Dutta, R	2013	61	1592	Acta Mater, 10.1016/	CAPLUS
Dutta, R	2013	559	86	Mater Sci Eng A, 10.	CAPLUS
Embury, J	1994	175	105	Mater Sci Eng A, 10.	
Evrard, P	2010	405	83	J Nucl Mater, 10.101	CAPLUS
Field, D	1992	40	1145	Acta Metall Mater, 1	CAPLUS
Galceran, M	2013	19	693	Microsc Microanal, 1	CAPLUS
Gao, H	2014	19	256	Sci Technol Weld Joi	
Gazder, A	2008	497	341	Mater Sci Eng A, 10.	CAPLUS
Gutierrez-Urrutia, I	2010	527	3552	Mater Sci Eng A, 10.	CAPLUS
Hansen, N	1999	357	1447	Philos Trans R Soc A	CAPLUS
Hanus, E	1993	3	1817	Le J Phys IV	
Hirth, J	1972	3	3047	Metall Trans, 10.100	CAPLUS

Huang, J	1989	37	3335	Acta Metall, 10.1016	CAPLUS
Hughes, D	2000	48	2985	Acta Mater, 10.1016/	CAPLUS
Hughes, D	1992	27	969	Scripta Metall Mater	CAPLUS
Ivanisenko, Y	2003	51	5555	Acta Mater, 10.1016/	CAPLUS
Ivanisenko, Y	2005	390	159	Mater Sci Eng A, 10.	CAPLUS
Jang, J	1990	24	1599	Scripta Metall Mater	CAPLUS
Kaneko, Y	1999	7	147	Interface Sci, 10.10	CAPLUS
Kitahara, H	2006	54	1279	Acta Mater, 10.1016/	CAPLUS
Kobayashi, S	2010	62	294	Scripta Mater, 10.10	CAPLUS
Kumar, K	2003	51	5743	Acta Mater, 10.1016/	CAPLUS
Lim, L	1987	35	1653	Acta Metall, 10.1016	CAPLUS
Liu, X	2013	69	413	Scripta Mater, 10.10	CAPLUS
Lu, K	1999	15	193	J Mater Sci Technol	CAPLUS
McMurtrey, M	2011	528	3730	Mater Sci Eng A, 10.	CAPLUS
Meyers, M	2006	51	427	Prog Mater Sci, 10.1	CAPLUS
Murr, L	1978	12	201	Scripta Metall, 10.1	CAPLUS
Pan, Y	1996	44	4685	Acta Mater, 10.1016/	CAPLUS
Peralta, P	2009	18	393	Int J Damage Mech, 1	CAPLUS
Randle, V	1998	46	1459	Acta Mater, 10.1016/	CAPLUS
Randle, V	1999	7	5	Interface Sci, 10.10	
Rauch, E	2005	36	552	Materialwissenschaft	CAPLUS
Renard, K	2012	542	8	Mater Sci Eng A, 10.	CAPLUS
Roland, T	2007	445-4	281	Mater Sci Eng A, 10.	CAPLUS
Roland, T	2006	524-5	716	Mater Sci Forum	
Roland, T	2005	490-4	625	Mater Sci Forum, 10.	CAPLUS
Roland, T	2006	54	1949	Scripta Mater, 10.10	CAPLUS
Sangid, M	2010	527	7115	Mater Sci Eng A, 10.	CAPLUS
Tao, N	2002	50	4603	Acta Mater, 10.1016/	CAPLUS
Thomson, C	1997	45	4909	Acta Mater, 10.1016/	CAPLUS
Tong, W	2003	299	686	Science, 10.1126/sci	CAPLUS
Ueji, R	2002	50	4177	Acta Mater, 10.1016/	CAPLUS
Valiev, R	1996	44	4705	Acta Mater, 10.1016/	CAPLUS
Villegas, J	2009	57	5782	Acta Mater, 10.1016/	CAPLUS
Wayne, L	2010	63	1065	Scripta Mater, 10.10	CAPLUS
Wu, X	2002	50	2075	Acta Mater, 10.1016/	CAPLUS
Wu, X	2005	53	681	Acta Mater, 10.1016/	CAPLUS
Yang, S	2005	7	723	Adv Eng Mater, 10.10	CAPLUS
Zaefferer, S	2007	107	254	Ultramicroscopy, 10.	CAPLUS
Zhang, H	2003	51	1871	Acta Mater, 10.1016/	CAPLUS
Zherebtsov, S	2013	61	1167	Acta Mater, 10.1016/	CAPLUS
Zhilyaev, A	2006	429	137	Mater Sci Eng A, 10.	CAPLUS
Zhilyaev, A	2002	46	575	Scripta Mater, 10.10	CAPLUS
Zhu, K	2004	52	4101	Acta Mater, 10.1016/	CAPLUS

IT 12604-89-6, S690QL1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 56-6 (Nonferrous Metals and Alloys)
ST nanostructure deformed high strength steel frequency ultrasonic impact treatment
IT Density
(Dislocation; formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)

IT Impact testing of materials
(High frequency ultrasonic; formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
IT Shot peening
(High-frequency; formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)

IT Crystal orientation
Grain boundaries
Grain refinement
Grain size
Lattice parameters
Microstructure
Nanostructured materials
Quenching (cooling)
Surface treatment
Welding of metals
Welds
(formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
IT Plastic deformation
(surface; formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
IT 12173-93-2, Martensite, formation (nonpreparative) 12244-31-4, Austenite, formation (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
IT 12604-89-6, S690QL1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(formation of nanostructures in severely deformed high-strength steel induced by high-frequency ultrasonic impact treatment)
OS.CITING REF COUNT: 6 THERE ARE 6 CAPLUS RECORDS THAT CITE THIS RECORD (6 CITINGS)

L15 ANSWER 61 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:1928036 CAPLUS Full-text
DOCUMENT NUMBER: 165:204310
TITLE: High temperature corrosion of thermally sprayed NiCr and FeCr coatings covered with a KCl-K2SO4 salt mixture
AUTHOR(S): Varis, T.; Bankiewicz, D.; Yrjas, P.; Oksa, M.; Suhonen, T.; Tuurna, S.; Ruusuvuori, K.; Holmstrom, S.
CORPORATE SOURCE: VTT, Espoo, FIN 02044, Finland
SOURCE: Surface and Coatings Technology (2015), 265, 235-243
CODEN: SCTEEJ; ISSN: 0257-8972
DIGITAL OBJECT ID: 10.1016/j.surfcoat.2014.11.012
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Current boiler tube materials and designs are sensitive to changes in process conditions. The desire to increase efficiency through the increase in process temp. and the use of high-chlorine and alkali contg. fuels such as biomass is challenging. The alloying of steel to increase the corrosion resistance leads to a significant increase in cost. Thermally sprayed coatings offer promising, effective, flexible and cost efficient soln. to fulfil the material needs for the future. However, some heat exchanger design alterations have to be overcome before global commercialization.High temp. corrosion in combustion plants can occur by a variety of mechanisms, including passive scale degrdn. with subsequent rapid scaling, loss of adhesion and scale detachment, attack by molten or partly molten deposits via fluxing reactions and intergranular/interlamellar corrosion. The activated chlorine corrosion mechanism plays a key role in the thermally sprayed coatings due to their unique lamellar structure.In this study, the corrosion behavior of NiCr and FeCr (HVOF and wire arc) thermally sprayed coatings was tested under simplified biomass combustion conditions. The tests were carried

out by using a KCl-K2SO4 salt mixt. as a synthetic biomass ash, which was placed on the coated materials and then heat treated for one week (168 h) at two different temps. (550 °C and 600 °C) and in two different gas atmospheres (air and air + 30% H2O). After exposure, the metallog. cross sections of the coatings were studied with SEM/EDX. The results showed that the coatings behaved relatively well at the lower test temp. while crit. interlamellar corrosion was obsd. in some cases at the higher test temp. A few coatings (HVOF Ni49Cr, HVOF Ni21Cr, and wire arc sprayed Fe30Cr) showed promising performance even at 600 °C in both atmospheres (dry and wet).

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Agarwal, D	1997			NACE Corrosion, New	
Anon	2013				
Bankiewicz, D	2009	23	3469	Energy Fuels	CAPLUS
Enestam, S	2011			Corrosivity of Hot F	
Grabke, H	2004	7	89	Mater Res	CAPLUS
Harper, M	1999		273		CAPLUS
Kofstad, P	1988		418	High Temperature Cor	
Lee, Y	1987	18A	1099	Metall Trans	CAPLUS
Livingston, N	1997			Corrosion, 97	
Makipaa, M	2004			VTT Symposium 233 BA	
Oksa, M	2011		17	Coatings, vol 1 (1)	
Oksa, M	2013	22	783	J Therm Spray Techno	CAPLUS
Regina, J	2004	61	69	Oxid Met	
Skrifvars, B	2008	50	1274	Corros Sci	CAPLUS
Skrifvars, B	2010	52	1011	Corros Sci	CAPLUS
Sorell, G	1991			ASM First Internatio	
Spiegel, M	1997		251	Mater Sci Forum	
Stott, F	1989	5	734	Mater Sci Technol	CAPLUS
Stott, F	1989	31	369	Oxid Met	
Tuurna, S	2011	62	642	Mater Corros	CAPLUS
Uusitalo, M	2004	46	1311	Corros Sci	CAPLUS
Uusitalo, M	2003	A346	168	Mater Sci Eng	CAPLUS
Westen-Karlsson, M	2008			Assessment of a Labo	
Zahs, A	2000	42	1093	Corros Sci	CAPLUS
Zahs, A	1999	80	561	Mater Corros	

IT 1491162-70-9, SHS 9172HV1 1966129-61-2, SHS7174
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high temp. corrosion of thermally sprayed nickel chromium and iron chromium coatings covered with potassium chloride potassium sulfate salt mixt.)

RN 1491162-70-9 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (SHS9172) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	28 - 100	7439-89-6
Cr	0 - 25	7440-47-3
W	0 - 15	7440-33-7
Nb	0 - 12	7440-03-1
Mo	0 - 6	7439-98-7
B	0 - 5	7440-42-8
C	0 - 4	7440-44-0
Mn	0 - 3	7439-96-5
Si	0 - 2	7440-21-3

RN 1966129-61-2 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Si,W (SHS7174) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	45 - 100	7439-89-6
Cr	0 - 30	7440-47-3
Mo	0 - 10	7439-98-7
B	0 - 5	7440-42-8

```
    W         0  -   4         7440-33-7
    C         0  -   2         7440-44-0
    Mn        0  -   2         7439-96-5
    Si        0  -   2         7440-21-3

CC   56-10 (Nonferrous Metals and Alloys)
ST   nickel iron chromium coating potassium chloride sulfate salt mixt; temp
     corrosion thermal spray
IT   Anticorrosive coating materials
     Biomass combustion
     Corrosion
     Flame spray coating process
     Heat treatment
     Microstructure
     Temperature
        (high temp. corrosion of thermally sprayed nickel chromium and iron
        chromium coatings covered with potassium chloride potassium
        sulfate salt mixt.)
IT   12725-20-1, TP347   68580-83-6, Sanicro 28
     RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process);
     PRP (Properties); PROC (Process)
        (high temp. corrosion of thermally sprayed nickel chromium and iron
        chromium coatings covered with potassium chloride potassium
        sulfate salt mixt.)
IT   1491162-70-9, SHS 9172HV1   1966129-61-2, SHS7174
     RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);
     PRP (Properties); TEM (Technical or engineered material use); PROC
     (Process); USES (Uses)
        (high temp. corrosion of thermally sprayed nickel chromium and iron
        chromium coatings covered with potassium chloride potassium
        sulfate salt mixt.)
IT   7447-40-7, Potassium chloride, processes   7778-80-5, Potassium sulfate,
     processes
     RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical
     process); PROC (Process); USES (Uses)
        (high temp. corrosion of thermally sprayed nickel chromium and iron
        chromium coatings covered with potassium chloride potassium
        sulfate salt mixt.)
IT   68565-87-7, Metcoloy 2   107501-85-9, CT45   165884-52-6, Diamalloy 4006
     1246457-49-7, 1260F   1966129-60-1
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (high temp. corrosion of thermally sprayed nickel chromium and iron
        chromium coatings covered with potassium chloride potassium
        sulfate salt mixt.)
OS.CITING REF COUNT:     19    THERE ARE 19 CAPLUS RECORDS THAT CITE THIS
                               RECORD (19 CITINGS)


L15  ANSWER 62 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2014:1754974  CAPLUS Full-text
DOCUMENT NUMBER:         161:584497
TITLE:                   Product formed by hot forming of metallic coated
                         steel sheet, method to form the product, and steel
                         strip
INVENTOR(S):             Chen, Shangping; Hensen, Guido Cornelis
PATENT ASSIGNEE(S):      Tata Steel IJmuiden BV, Neth.
SOURCE:                  PCT Int. Appl., 18 pp.
                         CODEN: PIXXD2
DOCUMENT TYPE:           Patent
LANGUAGE:                English
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     WO 2014166630        A1   20141016    WO 2014-EP951            20140409
     EP 2984198           A1   20160217    EP 2014-716760           20140409
     EP 2984198           B1   20210623
PRIORITY APPLN. INFO.:                    EP 2013-1845         A   20130410
                                          WO 2014-EP951        W   20140409
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
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     WO 2014166630        A1   Dead            20201202
     EP 2984198           A1   Indeterminate   20210624
     EP 2984198           B1   Indeterminate   20210624
AB   The invention relates to a product formed by hot forming of a metallic
     coated steel sheet, wherein the formed product has a substrate layer
     of hot formed steel, a metal affected zone and a diffusion coating
     layer on the substrate layer, and optionally a metal oxide layer on
     the diffusion coating layer.  According to the disclosure, a low
     carbon zone is present between the substrate layer and the metal
     affected zone.  The invention also relates to a method for producing a
     metallic coated hot formed product, and to a steel strip to be used in
     the method.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
ABE MASAYUKI           |2012 |     |      |US 20120006451 A1   |
HENSEN GUIDO CORNELIS  |2010 |     |      |WO 2010069588 A1    |CAPLUS
HIRAMATSU TERUSHI      |2001 |     |      |JP 2001064751 A     |CAPLUS
KATAGIRI YUKIO         |2011 |     |      |JP 2011208164 A     |CAPLUS
Karbasian, H           |2010 |210  |2103  |Journal Of Materials|CAPLUS
NAKAMURA NOBUYUKI      |2009 |     |      |EP 2053139 A1       |CAPLUS
PUERTA VELASQUEZ JUAN D|2014 |     |      |WO 2014037627 A1    |CAPLUS
IT   1630724-35-4
     RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical
     process); PRP (Properties); PROC (Process); USES (Uses)
        (substrate; product formed by hot forming of metallic coated
        steel sheet, method to form the product, and steel
        strip)
RN   1630724-35-4  CAPLUS
CN   Iron alloy, base, Fe 87-99,Mn 0.5-3,W 0-3,Nb 0-2,V 0-2,Cr 0-1,C 0.1-0.5,Si
     0.1-0.5,Al 0-0.2,Ti 0-0.2,B 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     87   -  99        7439-89-6
    Mn      0.5 -   3        7439-96-5
    W       0   -   3        7440-33-7
    Nb      0   -   2        7440-03-1
    V       0   -   2        7440-62-2
    Cr      0   -   1        7440-47-3
    C       0.1 -   0.5      7440-44-0
    Si      0.1 -   0.5      7440-21-3
    Al      0   -   0.2      7429-90-5
    Ti      0   -   0.2      7440-32-6
    B       0   -   0.1      7440-42-8
    P       0   -   0.1      7723-14-0

IPCI C22C0038-00 [I]; C21D0001-00 [I]
IPCR C22C0038-00 [I]; C21D0001-00 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   steel sheet strip hot dip metal anticorrosive coating
IT   Anticorrosive coating materials
     Hot-dip coating process
        (product formed by hot forming of metallic coated
        steel sheet, method to form the product, and steel
        strip)
IT   39308-06-0D, iron 0.011.   1630724-36-5   1630724-38-7
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (anticorrosive coating; product formed by hot forming of
        metallic coated steel sheet, method to form the
        product, and steel strip)
IT   870820-47-6, 22MnB5   1630724-35-4
     RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical
     process); PRP (Properties); PROC (Process); USES (Uses)
        (substrate; product formed by hot forming of metallic coated
        steel sheet, method to form the product, and steel
        strip)
OS.CITING REF COUNT:     3     THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD
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(3 CITINGS)

L15 ANSWER 63 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:1665234 CAPLUS Full-text
DOCUMENT NUMBER: 163:652920
TITLE: Thermal Spray Coatings for High-Temperature Corrosion Protection in Biomass Co-Fired Boilers
AUTHOR(S): Oksa, M.; Metsajoki, J.; Karki, J.
CORPORATE SOURCE: Materials and Manufacturing, VTT Technical Research Centre of Finland, Espoo, Finland
SOURCE: Journal of Thermal Spray Technology (2015), 24(1-2), 194-205
CODEN: JTTEE5; ISSN: 1059-9630
DIGITAL OBJECT ID: 10.1007/s11666-014-0155-5
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB There are over 1000 biomass boilers and about 500 plants using waste as fuel in Europe, and the nos. are increasing. Many of them encounter serious problems with high-temp. corrosion due to detrimental elements such as chlorides, alkali metals, and heavy metals. By HVOF spraying, it is possible to produce very dense and well-adhered coatings, which can be applied for corrosion protection of heat exchanger surfaces in biomass and waste-to-energy power plant boilers. Four HVOF coatings and one arc sprayed coating were exposed to actual biomass co-fired boiler conditions in superheater area with a probe measurement installation for 5900 h at 550 and 750 °C. The coating materials were Ni-Cr, IN625, Fe-Cr-W-Nb-Mo, and Ni-Cr-Ti. CJS and DJ Hybrid spray guns were used for HVOF spraying to compare the corrosion resistance of Ni-Cr coating structures. Ref. materials were ferritic steel T92 and nickel super alloy A263. The circulating fluidized bed boiler burnt a mixt. of wood, peat and coal. The coatings showed excellent corrosion resistance at 550 °C compared to the ferritic steel. At higher temp., NiCr sprayed with CJS had the best corrosion resistance. IN625 was consumed almost completely during the exposure at 750 °C.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				B Geddes, H Leon, an	
Anon				M Doing, et al, Biom	
Anon				M Oksa, J Karki and	
Enestam, S	2011	25	1396	Energy Fuels, 10.102	CAPLUS
Hussain, T	2013	22	797	J Therm Spray Techno	CAPLUS
Kawahara, Y	2007	162	202	J Therm Spray Techno	CAPLUS
Khan, A	2009	90	21	Fuel Process Technol	CAPLUS
Ma, H	2009	51	1861	Corros Sci, 10.1016/	CAPLUS
Michelsen, H	1998	54	95	Fuel Process Technol	CAPLUS
Montgomery, M	2008	59	783	Mater Corros, 10.100	CAPLUS
Montgomery, M	2013	64	14	Mater Corros, 10.100	CAPLUS
Montgomery, M	2006	522-5	523	Mater Sci Forum, 10.	CAPLUS
Nakagawa, K	1997	251-2	535	Mater Sci Forum, 10.	CAPLUS
Natesan, K	2007	32	3689	Int J Hydrogen Energ	CAPLUS
Oksa, M	2013	22	783	J Therm Spray Techno	CAPLUS
Oliver, W	1992	7	1564	J Mater Res, 10.1557	CAPLUS
Sajjadi, S	2006	175	376	J Mater Proc Technol	CAPLUS
Sandberg, J	2011	88	99	Appl Energy, 10.1016	CAPLUS
Sandberg, J	2011	88	99	Appl Energy, 10.1016	CAPLUS
Schutze, M	2006	201	3872	Surf Coat Technol, 1	CAPLUS
Singh, P	1996	34	1861	Scr Mater, 10.1016/1	CAPLUS
Skrifvars, B	2008	50	1274	Corros Sci, 10.1016/	CAPLUS
Spiegel, M	1999	50	373	Mater Corros, 10.100	CAPLUS
Varis, T	2014	23	1009	J Therm Spray Techno	CAPLUS
Zahs, A	2000	42	1093	Corros Sci, 10.1016/	CAPLUS

IT 1491162-70-9, SHS9172HV1
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(thermal Spray Coatings for High-Temp. Corrosion Protection in Biomass Co-Fired Boilers)
RN 1491162-70-9 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (SHS9172) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	28 - 100	7439-89-6
Cr	0 - 25	7440-47-3
W	0 - 15	7440-33-7
Nb	0 - 12	7440-03-1
Mo	0 - 6	7439-98-7
B	0 - 5	7440-42-8
C	0 - 4	7440-44-0
Mn	0 - 3	7439-96-5
Si	0 - 2	7440-21-3

CC 55-6 (Ferrous Metals and Alloys)
ST thermal spray coating corrosion protection
IT Coating materials
Corrosion prevention
Corrosion resistance
Microstructure
(thermal Spray Coatings for High-Temp. Corrosion Protection in Biomass Co-Fired Boilers)
IT 1491162-70-9, SHS9172HV1
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(thermal Spray Coatings for High-Temp. Corrosion Protection in Biomass Co-Fired Boilers)
IT 12682-01-8, IN625 12720-48-8, Nimonic 263 107501-85-9, Tafa 45CT 138410-99-8, T92 1246457-49-7, 1260F
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(thermal Spray Coatings for High-Temp. Corrosion Protection in Biomass Co-Fired Boilers)
OS.CITING REF COUNT: 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD (8 CITINGS)

L15 ANSWER 64 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:777339 CAPLUS Full-text
DOCUMENT NUMBER: 163:194028
TITLE: Performance testing of iron based thermally sprayed HVOF coatings in a biomass-fired fluidised bed boiler
AUTHOR(S): Oksa, Maria; Varis, Tommi; Ruusuvuori, Kimmo
CORPORATE SOURCE: VTT Technical Research Centre of Finland, Espoo, 02044, Finland
SOURCE: Surface and Coatings Technology (2014), 251, 191-200
CODEN: SCTEEJ; ISSN: 0257-8972
DIGITAL OBJECT ID: 10.1016/j.surfcoat.2014.04.025
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Managing high temp. corrosion problems in biomass firing boilers has been challenging esp. due to high amts. of chem. active compds., in particular alkali chlorides. Thermally sprayed coatings with high chromium content can offer a soln. for protecting low alloyed substrate materials in locations prone to high temp. corrosion. Two thermally sprayed (HVOF - high velocity oxy-fuel) iron based coatings (Fe-27Cr-11Ni-4Mo and Fe-19Cr-9W-7Nb-4Mo) were exposed to biomass boiler conditions for two years. The fluidised bed boiler for district heating used mainly wood-based fuels mixed with small amts. of peat. The coated tubes were located at the hot economiser of the boiler, where the estd. material temp. was about 200 °C max. After the exposure the coatings and the carbon steel St35.8 substrate material were analyzed with SEM-EDX. It was detected that corrosion due to elements such as chlorine, potassium, zinc, lead and copper had caused severe material wastage in the biomass boiler with relatively low heat exchanger surface temps. The low alloyed boiler tubes had suffered severely with a corrosion rate as high as 2 mm/yr, whereas dense thermal spray coatings offered excellent protection during the exposure.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File

Aho, M	2010	89	2376	Fuel	CAPLUS
Amand, L	2006	85	1313	Fuel	
Anon	2004			Handbook on Thermal	
Antunes, R	2013	76	6	Corros Sci	CAPLUS
Asteman, H	1999	52	95	Oxid Met	CAPLUS
Bramhoff, D	1990	41	303	Werkst Korros	CAPLUS
Branagan, D	2011	169	33	Adv Mater Process	
Ehlers, J	2006	48	3428	Corros Sci	CAPLUS
Enestam, S	2011			Corrosivity of Hot F	
Frandsen, F	2005	84	1277	Fuel	
Galetz, M	2012	63	1	Mater Corros	
Grabke, H	2004	7	89	Mater Res	CAPLUS
Grabke, H	1989		161	Proceedings of the I	
Hansen, L	2000	64	189	Fuel Process Technol	CAPLUS
Henderson, P	2006	57	128	Mater Corros	CAPLUS
Huijbregts, W	2004	51	173	Anti-Corros Methods	CAPLUS
Hupa, M	2012	26	4	Energy Fuel	CAPLUS
Inoue, A	2001	A304-	1	Mater Sci Eng	CAPLUS
Ishitsuka, T	2002	44	247	Corros Sci	CAPLUS
Kaur, M	2008	55	86	Anti-Corros Methods	CAPLUS
Kofstad, P	1988		558	High Temperature Cor	
Lind, T	2006	20	61	Energy Fuel	CAPLUS
Montgomery, M	2008	59	783	Mater Corros	CAPLUS
Montgomery, M	2013	64	14	Mater Corros	CAPLUS
Montgomery, M	2006	522-5	523	Mater Sci Forum	CAPLUS
Nakagawa, K	1997	251-2	535	Mater Sci Forum	CAPLUS
Nielsen, H	1999	13	1114	Energy Fuel	CAPLUS
Obernberger, I	2004	27	653	Biomass Bioenergy	CAPLUS
Oksa, M	2011	1	17	Coatings	
Oksa, M	2013	22	783	J Therm Spray Techno	CAPLUS
Otsuka, N	2008	50	1627	Corros Sci	CAPLUS
Paul, L	2007	111	64	Power Eng	
Persson, K	2007	88	1178	Fuel Process Technol	CAPLUS
Pettersson, J	2009	72	159	Oxid Met	CAPLUS
Regina, J	2004	61	69	Oxid Met	CAPLUS
Sandberg, J	2011	88	99	Appl Energy	CAPLUS
Sidhu, H	2006	200	5386	Surf Coat Technol	CAPLUS
Sidhu, T	2006	55	179	Scr Mater	CAPLUS
Sippula, O	2008	87	2425	Fuel	CAPLUS
Skrifvars, B	2010	52	1011	Corros Sci	CAPLUS
Spiegel, M	1999	50	373	Mater Corros	CAPLUS
Spiegel, M	2003	20	153	Mater High Temp	CAPLUS
Uusitalo, M	2003	A346	168	Mater Sci Eng	CAPLUS
Vassilev, S	2013	112	391	Fuel	CAPLUS
Viklund, P	2009	44	234	Corros Eng Sci Techn	CAPLUS
Zahs, A	2000	42	1093	Corros Sci	CAPLUS

IT 1491162-70-9, SHS9172HV1
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; performance testing of iron based thermally sprayed HVOF coatings in biomass-fired fluidized bed boiler)
RN 1491162-70-9 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (SHS9172) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	28 - 100	7439-89-6
Cr	0 - 25	7440-47-3
W	0 - 15	7440-33-7
Nb	0 - 12	7440-03-1
Mo	0 - 6	7439-98-7
B	0 - 5	7440-42-8
C	0 - 4	7440-44-0
Mn	0 - 3	7439-96-5
Si	0 - 2	7440-21-3

CC 55-10 (Ferrous Metals and Alloys)
ST fluidized bed boiler biomass firing; fluidized bed boiler iron thermal spraying HVOF coating
IT Anticorrosive coating materials

Biomass
Corrosion
Corrosion kinetics
Flame spray coating process
Fluidized-bed boilers
Microstructure
Surface roughening
(performance testing of iron based thermally sprayed HVOF coatings in biomass-fired fluidized bed boiler)

IT 1491162-70-9, SHS9172HV1 1800215-33-1
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; performance testing of iron based thermally sprayed HVOF coatings in biomass-fired fluidized bed boiler)

IT 37270-33-0, St35.8, processes
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(substrate; performance testing of iron based thermally sprayed HVOF coatings in biomass-fired fluidized bed boiler)

OS.CITING REF COUNT: 15 THERE ARE 15 CAPLUS RECORDS THAT CITE THIS RECORD (15 CITINGS)

L15 ANSWER 65 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:755736 CAPLUS Full-text
DOCUMENT NUMBER: 160:679480
TITLE: Steel sheets for hot pressing, hot pressed steel members, and method for manufacture of the members
INVENTOR(S): Miyoshi, Tatsuya; Nakajima, Seiji; Ando, Satoru
PATENT ASSIGNEE(S): JFE Steel Corporation, Japan
SOURCE: PCT Int. Appl., 29pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014068939	A1	20140508	WO 2013-JP6347	20131028
KR 2015052266	A	20150513	KR 2015-7008668	20131028
KR 1731740	B1	20170428		
CN 104755655	A	20150701	CN 2013-80056511	20131028
CN 104755655	B	20170922		
EP 2915904	A1	20150909	EP 2013-850861	20131028
EP 2915904	B1	20190612		
JP 5888430	B2	20160322	JP 2014-544298	20131028
IN 2015DN02108	A	20150814	IN 2015-DN2108	20150316
IN 302263	B	20181026		
US 20150337415	A1	20151126	US 2015-14438993	20150428
US 10030290	B2	20180724		

PRIORITY APPLN. INFO.: JP 2012-239973 A 20121031
WO 2013-JP6347 W 20131028

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2014068939	A1	Dead	20201202
KR 2015052266	A	Alive	20201121
KR 1731740	B1	Alive	20201121
CN 104755655	A	Alive	20201120
CN 104755655	B	Alive	20201120
EP 2915904	A1	Indeterminate	20201106
EP 2915904	B1	Indeterminate	20201107
JP 5888430	B2	Alive	20201121
IN 2015DN02108	A	Alive	20201121
US 20150337415	A1	Alive	20201120
US 10030290	B2	Alive	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Base steel sheet equipped with galvanized layer and a layer, contg. polysiloxanes having C≥4 functional group, formed in the order is claimed. Preferably, the steel sheet consists of C 0.15-0.5, Si 0.05-2.0, Mn 0.5-3, P ≤0.1, S ≤0.05, Al ≤0.10, N ≤0.010, optionally Cr 0.01-1, Ti ≤0.20, B 0.0005-0.08,

and/or Sb 0.003-0.03 wt.%, and balance Fe; the galvanized layer comprises a 0.01-5 g/m2 1st layer of ≥60 wt.% Ni and balance Zn and a 10-90 g/m2 2nd layer of 10-25 wt.% Ni and balance Zn; and the polysiloxane layer also contains less wt. parts (polysiloxane basis) silane coupling agents. Also claimed is the hot pressed member of the given steel having a surface characterized by a ≥0.20 kcps x-ray diffractometry peak for Zn2SiO4 at 2θ = 36.1°. The member is manufd. by heating the sheet to a temp. between Ac3 and 1000°, e.g. at av. heating rate of ≥100°/s, followed by its hot pressing. The members are resistant to pit and crevice corrosion even when used under severe conditions and are esp. suitable for use in automobiles.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	2012			JP 4883240 B1	CAPLUS
KUZE YUKINOBU	2011			WO 2011070859 A1	CAPLUS
SAITO TAKASHI	2007			JP 2007063578 A	CAPLUS
YANO HIROKAZU	2007			JP 2007246775 A	CAPLUS

IT 1609017-11-9D, Sb(0.003-0.03)
RL: TEM (Technical or engineered material use); USES (Uses)
(steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
RN 1609017-11-9 CAPLUS
CN Iron alloy, base, Fe 93-99,Mn 0.5-3,Si 0-2,Cr 0-1,C 0.2-0.5,Ti 0.2,Al 0.1,P 0.1,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Ti	0.2	7440-32-6
Al	0.1	7429-90-5
P	0.1	7723-14-0
B	0 - 0.1	7440-42-8

IPCI C23C0028-00 [I]; B21D0022-20 [I]; B32B0015-08 [I]; C21D0001-18 [I]; C21D0009-00 [I]; C22C0018-00 [I]; C22C0019-03 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C25D0005-26 [I]
IPCR C23C0028-00 [I]; B21D0022-20 [I]; B32B0015-08 [I]; C21D0001-18 [I]; C21D0009-00 [I]; C22C0018-00 [I]; C22C0019-03 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C25D0005-26 [I]
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 42, 56
ST hot pressing steel sheet corrosion resistant; polysiloxane coated galvanized steel hot pressing; nickel zinc alloy underlayer silicone coated steel
IT Polysiloxanes
RL: TEM (Technical or engineered material use); USES (Uses)
(C>4 group-contg., coating on galvanized steel; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Polysiloxanes
RL: TEM (Technical or engineered material use); USES (Uses)
(Me Ph, KR-311; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Silanes
RL: MOA (Modifier or additive use); USES (Uses)
(coupling agent, in silicone layer; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Polysiloxanes
RL: TEM (Technical or engineered material use); USES (Uses)
(epoxy, ES-1001N; steel sheets having nickel-zinc alloy and

polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Epoxy resins
RL: TEM (Technical or engineered material use); USES (Uses)
(polysiloxane-, ES-1001N; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Metalworking
(pressing; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Coupling agents
(silane, in silicone layer; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Corrosion-resistant materials
Hot-press molding
(steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT Galvanized steel
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT 919-30-2, KBE 903 2602-34-8, KBE 403
RL: MOA (Modifier or additive use); USES (Uses)
(coupling agent, in silicone layer; steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT 13597-65-4P, Zinc silicate (Zn2SiO4)
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
IT 7440-36-0D, Antimony, trace in alloys 238084-01-0 1379822-01-1 1609017-10-8 1609017-11-9D, Sb(0.003-0.03)
RL: TEM (Technical or engineered material use); USES (Uses)
(steel sheets having nickel-zinc alloy and polysiloxane coatings for prepn. of hot pressed members showing excellent corrosion resistance)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 66 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:607904 CAPLUS Full-text
DOCUMENT NUMBER: 162:672996
TITLE: Enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying
AUTHOR(S): Liu, Wu-Han; Shieu, Fuh-Sheng; Hsiao, Wei-Tien
CORPORATE SOURCE: Department of Materials Science and Engineering, National Chung Hsing University, Taichung, Taiwan
SOURCE: Surface and Coatings Technology (2014), 249, 24-41
CODEN: SCTEEJ; ISSN: 0257-8972
DIGITAL OBJECT ID: 10.1016/j.surfcoat.2014.03.041
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Fe-based alloy material is widely used in the corrosive environment of seawater. It is replacing expensive cobalt and nickel-based alloys. Amorphous iron-based (Fe-based) alloy coatings can be deposited on stainless steel by high-velocity oxygen fuel (HVOF) thermal spraying. Following spraying, coatings were heat-treated at 500, 600, 700, 800, and 900 °C for up to three hours in a vacuum furnace. The microstructures of such coatings were analyzed herein using an optical microscope (OM) and scanning electron microscope (SEM) to monitor the morphologies of both powders and coatings of Fe-based alloy. Phase anal. was performed by X-ray diffraction (XRD) and XPS. The goal of this

work on the modification of Fe-based alloy feedstock powder is to enhance the corrosion and wear properties of these coatings. The results of this investigation reveal that adding a cobalt material to Fe-based alloy yields coatings with enhanced corrosion and tribol. characteristics.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Amiya, K	2005	97		J Appl Phys	CAPLUS
Anis, M	1994	172	135	Wear	CAPLUS
Anon				J.C. Farmer, J.J. Ha	
Anon				P. Crook, A.I. Aspha	
Anon				T. Zhang, D. Tang, R	
Asami, K	1977	17	713	Corros Sci	CAPLUS
Bayer, A	1989		51	High Speed Tool Stee	
Bera, S	2000	42	1709	Corros Sci	CAPLUS
Blink, J	2009	40	1344	Metall Mater Trans A	
Bouaricha, P	2004			Advances in Technolo	
Branagan, D	2004			High-Performance Cor	
Branagan, D	2005	14	196	J Therm Spray Techn	
Branagan, D	2001	32	2615	Metall Mater Trans A	
Branagan, D	2009	40	1306	Metall Mater Trans A	
Briki, J	2012	84190	1	J Metall	
Buttner, M	2007	102		J Appl Phys	CAPLUS
Campos, I	2006	201	2438	Surf Coat Technol	CAPLUS
Cappelli, E	1999	138-1	376	Appl Surf Sci	CAPLUS
Chokethawai, K	2009	480	351	J Alloys Compd	CAPLUS
Cong, C	2006	17	1520	Nanotechnology	CAPLUS
Cooper, C	1990	43-44	756	Surf Coat Technol	CAPLUS
Cremaschi, V	2002	46	95	Scr Mater	CAPLUS
Dallaire, S	1982	95	237	Thin Solid Films	CAPLUS
Damyanova, S	2003	239	241	Appl Catal A General	CAPLUS
Decker, R	1988		1	Maraging Steels, Pro	
Detroye, M	1999	144-1	78	Appl Surf Sci	CAPLUS
Ding, Z	2011	21	2231	Trans Nonferrous Met	CAPLUS
Dybkov, V	2011	27	1502	Mater Sci Technol	CAPLUS
El-Moneim, A	1998	40	235	Corros Sci	CAPLUS
Farmer, J	2004			High-Performance Cor	
Farmer, J	2007	22	2297	J Mater Res	CAPLUS
Frankwicz, P	1996	68	2825	Appl Phys Lett	CAPLUS
Greim, J	2012	6	220	Ullmann's, 10.1002/1	CAPLUS
Grigorescu, I	1995	76	494	Surf Coat Technol	
Ingham, H	1965			Metco Flame Spray Ha	
Inoue, A	2000	48	279	Acta Mat	CAPLUS
Inoue, A	2008	304-3	1	Mater Sci Eng A	
Inoue, A	1997	38	749	Mater Trans JIM	CAPLUS
Inoue, A	2006	47	1275	Mater Trans JIM	CAPLUS
K uper, A	2000	130	87	Surf Coat Technol	CAPLUS
Kim, J	2009	267	1415	Wear	CAPLUS
Kodama, D	2006	18	3154	Adv Mater	CAPLUS
Koziel, T	2006	224	27	J Microsc	CAPLUS
Kumashiro, Y	1982	1	49	J Mater Sci Lett	CAPLUS
Li, H	2008	17	68	China Build Mater Sc	
Lin, L	1998	106	100	Surf Coat Technol	CAPLUS
Liyanage, T	2010	205	759	Surf Coat Technol	CAPLUS
Lorinczi, J	2003	414-4	267	Mater Sci Forum	CAPLUS
Lu, Z	2000	270	103	J Non-Cryst Solids	CAPLUS
Lu, Z	2000	42	667	Scr Mater	CAPLUS
Lua, S	2002	153	40	Surf Coat Technol	
Ma, S	2011	205	4902	Surf Coat Technol	CAPLUS
Makino, A	2008	148	166	Mater Sci Eng B	CAPLUS
Mavel, G	1973	35	109	Surf Sci	CAPLUS
Mcpherson, R	1981	83	297	Thin Solid Films	CAPLUS
Mini c, D	2009	476	705	J Alloy Compd	CAPLUS
Miyoshi, A	1965	12	78	J Jpn Soc Powder Met	CAPLUS
Moulder, J	1992			Handbook of X-Ray Ph	
Muller, U	2011	59	1150	Acta Mater	
Natarajan, R	2009	2	114	Open Corros J	CAPLUS
Nemoshkalenko, V	1975	36	37	J Phys Chem Solids	CAPLUS
Ni, H	2009	467	163	J Alloys Compd	CAPLUS
Niranatlumpong, P	2011	206	440	Surf Coat Technol	CAPLUS
Novak, M	2007		1	Proceedings of the A	

Olefjord, I	1975	15	697	Corros Sci	CAPLUS
Parco, M	2007	201	6290	Surf Coat Technol	CAPLUS
Parkansky, N	1998	105	130	Surf Coat Technol	CAPLUS
Pauling, L	1960			In the Nature of the	
Paunescu, R	2012	74	225	Sci Bull Ser B	CAPLUS
Perkins, R	1990	42	17	J Min Met Mater Soc	CAPLUS
Ponnambalam, V	2003	83	1131	Appl Phys Lett	CAPLUS
Racek, O	2008			High-Performance Cor	
Ranganathan, S	1987	9	149	Bull Mater Sci	CAPLUS
Rietveld, H	1969	2	65	J Appl Crystallogr	CAPLUS
Roberts, G	1998		45	Tool Steels, 5th ed	
SHS Product Technical D				The NanoSteel, Co, h	
Sa Brito, V	2012	41	282	Mater Design	CAPLUS
Sampath, S	1993	167	1	Mater Sci Eng A	
Sarjas, H	2012	18	34	Mater Sci	
Scanlon, D	2010	114	4636	J Phys Chem C	CAPLUS
Sharma, S	1991	51	139	Appl Surf Sci	CAPLUS
Shen, B	2004	85	4911	Appl Phys Lett	CAPLUS
Shieh, Y	1993	58	73	Surf Coat Technol	CAPLUS
Sobolev, V	1994	18	304	Mater Lett	CAPLUS
Solomom, I	2010	46	389	Rev Metal Madrid	
Takahara, Y	1995	36	903	Mater Trans JIM	CAPLUS
Tao, P	2011	40	1625	Rare Metal Mater Eng	CAPLUS
Vajeeston, P	2001	63		Phys Rev B	CAPLUS
Wang, D	2008	202	1371	Surf Coat Technol	CAPLUS
Wang, W	2004	44	45	Mater Sci Eng R	
Whang, S	1982		1403	Wear Behavior of an	
Wu, Y	2009	481	719	J Alloys Compd	CAPLUS
Xiao, B	2010	405	1274	Physica B	CAPLUS
Yanagihara, K	2011		27	Nippon Steel Technic	
Yang, N	2004			High-Performance Cor	
Yin, S	2013	33	409	Int J High Pres Res	CAPLUS
Zhang, J	2005	53	183	Scr Mater	CAPLUS
Zhou, J	2010	19	950	J Therm Spray Techn	CAPLUS
Zhou, Z	2009	19	636	Trans Nonferrous Met	
Zois, D	2010	504	283	J Alloy Compd	
Zois, D	2011	206	1469	Surf Coat Technol	CAPLUS

IT 1491162-70-9, SHS9172
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrate, coating; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

RN 1491162-70-9 CAPLUS

CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (SHS9172) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	28 - 100	7439-89-6
Cr	0 - 25	7440-47-3
W	0 - 15	7440-33-7
Nb	0 - 12	7440-03-1
Mo	0 - 6	7439-98-7
B	0 - 5	7440-42-8
C	0 - 4	7440-44-0
Mn	0 - 3	7439-96-5
Si	0 - 2	7440-21-3

CC 55-6 (Ferrous Metals and Alloys)

ST wear corrosion resistance iron coating deposited HVOF thermal spraying

IT Coating materials
(abrasion-resistant; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

IT Abrasion-resistant materials
(coatings; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

IT Adhesion, physical

Annealing
Anticorrosive coating materials
Corrosion resistance
Crystallinity
Crystallization
Crystallization enthalpy
Electric current-potential relationship
Flame spray coating process
Glass transition
Glass transition temperature
Grain size
Heat capacity
Microhardness
Microstructure
Porosity
Seawater
Thermal oxidation
Wear resistance
(enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

IT 7440-48-4, Cobalt, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

IT 1491162-70-9, SHS9172
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrate, coating; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

IT 12597-68-1, Stainless steel, processes
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(substrate; enhancement of wear and corrosion resistance of iron-based hard coatings deposited by high-velocity oxygen fuel (HVOF) thermal spraying)

OS.CITING REF COUNT: 50 THERE ARE 50 CAPLUS RECORDS THAT CITE THIS RECORD (51 CITINGS)

L15 ANSWER 67 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:451007 CAPLUS Full-text
DOCUMENT NUMBER: 160:475772
TITLE: Compression coil springs and their manufacture including coiling process in austenite temperature region
INVENTOR(S): Ono, Yuitirou; Shiraishi, Tohru; Ono, Yoshiki; Takahashi, Keita
PATENT ASSIGNEE(S): NHK Spring Co., Ltd., Japan
SOURCE: PCT Int. Appl., 50pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014042066	A1	20140320	WO 2013-JP73937	20130905
JP 5361098	B1	20131204	JP 2012-202416	20120914
JP 2014055343	A	20140327		
CN 104619878	A	20150513	CN 2013-80047783	20130905
CN 104619878	B	20161116		
KR 2015054969	A	20150520	KR 2015-7009184	20130905
KR 2191407	B1	20201215		
EP 2896712	A1	20150722	EP 2013-837663	20130905
EP 2896712	B1	20190807		
KR 2020010619	A	20200130	KR 2020-7002286	20130905
US 20150252863	A1	20150910	US 2015-14427106	20150310

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     US 9752636            B2   20170905
     IN 2015KN00953        A    20151225     IN 2015-KN953           20150407
PRIORITY APPLN. INFO.:                       JP 2012-202416       A  20120914
                                             KR 2015-7009184      A3 20130905
                                             WO 2013-JP73937      W  20130905

PATENT STATUS PATENT INFORMATION:
     PATENT NO.            KIND  STATUS           STATUS DATE
     ---------------       ----  -------------    -----------
     WO 2014042066         A1    Dead             20201202
     JP 5361098            B1    Alive            20201121
     JP 2014055343         A     Alive            20201121
     CN 104619878          A     Alive            20201121
     CN 104619878          B     Alive            20201121
     KR 2015054969         A     Alive            20201121
     KR 2191407            B1    Alive            20201224
     EP 2896712            A1    Indeterminate    20201106
     EP 2896712            B1    Indeterminate    20201106
     KR 2020010619         A     Dead             20201120
     US 20150252863        A1    Alive            20201120
     US 9752636            B2    Alive            20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The coil springs comprise steel wires with equiv. circle diam. 2.5-10 mm
     contg. C 0.45-0.80, Si 0.15-2.50, Mn 0.3-1.0 wt.%, and Fe balance, wherein
     (i) arbitrary cross-sections of the wires show core hardness 570-700HV,
     (ii) the wires have surface layers with higher-than-av. concn. of C, and
     (iii) the wires show compressive residual stress ≥200 MPa and
     ≥60 MPa at 0.2 mm-depth and 0.4 mm-depth from the surfaces, resp.
     along the max. principal stress direction under application of compressive
     load in the inner diam. side of the coil springs.  Also claimed are coil
     springs using steel wires contg. C 0.45-0.80, Si 0.15-2.50, Mn 0.3-1.0,
     and Cr, B, Ni, Ti, Cu, Nb, V, Mo, and/or W 0.005-4.5 wt.%.  The manufg.
     method, using coil spring forming app. equipped with feed rollers, coiling
     parts having wire guides, coiling tools, and pitch tools, cutting means,
     and heating means for raising temp. to austenite region within 2.5 s
     between the feed roller exits to the coiling tools, includes coiling
     steel wires by hot forming, cutting, quenching the formed coils still at
     temp. in austenite region, tempering, shot-peening, setting in this order,
     and carburizing (between heating and quenching processes) by directly
     spraying hydrocarbon gas on the wire surfaces.  The coil springs with
     excellent fatigue resistance are esp. useful as automotive valve springs
     and clutch torsion springs.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work     | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |       (RWK)         | File
=======================+=====+=====+======+=====================+===========
Anon                   |1981 |     |      |JP 56152921 A        |
Anon                   |1989 |     |      |JP 01177318 A        |CAPLUS
Anon                   |1992 |     |      |JP 499126 A          |
Anon                   |1993 |     |      |JP 586418 A          |
Anon                   |2012 |     |      |JP 5064590 B1        |CAPLUS
HONDA YOSHINORI        |2001 |     |      |JP 2001082518 A      |CAPLUS
KONDO SATORU           |2000 |     |      |JP 2000326036 A      |CAPLUS
MORITA TOSHIYUKI       |2008 |     |      |JP 2008045178 A      |CAPLUS
NISSAN MOTOR           |2012 |     |      |JP 2012077367 A      |CAPLUS
IT   1581259-99-5
     RL: TEM (Technical or engineered material use); USES (Uses)
        (manuf. of compression coil springs including coiling process in
        austenite temp. region)
RN   1581259-99-5  CAPLUS
CN   Iron alloy, base, Fe 91-99,B 0-4.5,Cr 0-4.5,Cu 0-4.5,Mo 0-4.5,Nb 0-4.5,Ni
     0-4.5,Ti 0-4.5,V 0-4.5,W 0-4.5,Si 0.2-2.5,Mn 0.3-1,C 0.4-0.8  (CA INDEX
     NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      91   -  99       7439-89-6
    B        0   -   4.5     7440-42-8
    Cr       0   -   4.5     7440-47-3
    Cu       0   -   4.5     7440-50-8
    Mo       0   -   4.5     7439-98-7
    Nb       0   -   4.5     7440-03-1
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Ni	0	-	4.5	7440-02-0
Ti	0	-	4.5	7440-32-6
V	0	-	4.5	7440-62-2
W	0	-	4.5	7440-33-7
Si	0.2	-	2.5	7440-21-3
Mn	0.3	-	1	7439-96-5
C	0.4	-	0.8	7440-44-0

IPCI C22C0038-00 [I]; B21F0003-02 [I]; B21F0035-00 [I]; B24C0001-10 [I];
B24C0011-00 [I]; C21D0001-06 [I]; C21D0007-06 [I]; C21D0008-06 [I];
C21D0009-02 [I]; C22C0038-04 [I]; C22C0038-54 [I]; C23C0008-22 [I];
C23C0008-80 [I]; F16F0001-06 [I]
IPCR C22C0038-00 [I]; B21F0003-02 [I]; B21F0035-00 [I]; B24C0001-10 [I];
B24C0011-00 [I]; C21D0001-06 [I]; C21D0007-06 [I]; C21D0008-06 [I];
C21D0009-02 [I]; C22C0038-04 [I]; C22C0038-54 [I]; C23C0008-22 [I];
C23C0008-80 [I]; F16F0001-06 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST compression coil spring manuf austenite temp region coiling; steel wire heating quenching tempering shot peening carburizing
IT 1581259-99-5
RL: TEM (Technical or engineered material use); USES (Uses)
(manuf. of compression coil springs including coiling process in austenite temp. region)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 68 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2014:174777 CAPLUS Full-text
DOCUMENT NUMBER: 160:297675
TITLE: Hot-dip galvanized steel sheet and manufacturing method therefor
INVENTOR(S): Fujita, Soshi; Yamanaka, Shintaro
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: PCT Int. Appl., 58pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2014021452	A1	20140206	WO 2013-JP71004	20130802
JP 5648755	B2	20150107	JP 2013-551091	20130802
KR 2015036681	A	20150407	KR 2015-7004127	20130802
KR 1653510	B1	20160901		
CN 104508169	A	20150408	CN 2013-80040033	20130802
CN 104508169	B	20170222		
TW I488978	B	20150621	TW 2013-127806	20130802
BR 112015001809	A2	20170704	BR 2015-112015001809	20130802
BR 112015001809	B1	20201110		
MX 2015001224	A	20150410	MX 2015-1224	20150127
MX 370268	B	20191209		
US 20150225829	A1	20150813	US 2015-14418852	20150130
US 10131981	B2	20181120		
IN 2015DN01525	A	20150703	IN 2015-DN1525	20150224

PRIORITY APPLN. INFO.:

JP 2012-172739	A	20120803
WO 2013-JP71004	W	20130802

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2014021452	A1	Dead	20201201
JP 5648755	B2	Alive	20201121
KR 2015036681	A	Alive	20201121
KR 1653510	B1	Alive	20201121
CN 104508169	A	Alive	20201121
CN 104508169	B	Alive	20201121
TW I488978	B	Dead	20210923
BR 112015001809	A2	Alive	20201127
BR 112015001809	B1	Alive	20201127
MX 2015001224	A	Alive	20201120
MX 370268	B	Alive	20201120

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     US 20150225829       A1   Alive           20201120
     US 10131981          B2   Alive           20201121
     IN 2015DN01525       A    Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The present invention provides a hot-dip galvanized steel sheet having
     excellent plating wettability and plating adhesion even when the base
     steel sheet contains Si and Mn, and provides a manufg. method therefor.
     The galvanized steel sheet pertaining to the present invention includes
     a base steel sheet contg. Si, Mn, and other predetd. components, and a
     galvanized layer formed on at least one surface of the base steel
     sheet.  The base steel sheet has an HA value and an HB that satisfy all
     of the following relational expressions, wherein HA is the av. hardness of
     the surface layer that extends to a depth of 50 μm from the interface
     between the base steel sheet and the galvanized layer, and HB is the
     av. hardness of deep portions in excess of 50 μm from the interface. 50
     ≤ HA ≤ 500 ... (1) 50 ≤ HB ≤ 500 ... (2) 0.5
     ≤ HA/HB ≤ 0.9 ... (3).  The galvanized steel sheet is
     manufd. by hot-dip galvanizing of a base steel sheet which is processed
     by annealing and soaking in controlled conditions (details described).
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+==========
Anon                   |1999 |     |      |JP 11343551 A       |CAPLUS
MIYATA MAI             |2010 |     |      |JP 2010132975 A     |CAPLUS
IT   1428957-53-2
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (base steel sheet; manuf. of hot-dip galvanized steel
        sheet contg. Si and Mn in base steel sheet and showing good
        wettability and plating adhesion)
RN   1428957-53-2  CAPLUS
CN   Iron alloy, base, Fe 78-99,Mn 0.5-5,Si 0.1-3,Al 0-1,B 0-1,Ca 0-1,Cr 0-1,Cu
     0-1,misch metal 0-1,Mo 0-1,Nb 0-1,Ni 0-1,Ti 0-1,V 0-1,W 0-1,Zr 0-1,C
     0-0.5,P 0-0.5  (CA INDEX NAME)

   Component       Component      Component
                    Percent    Registry Number
===============+=============+================
Fe                78   -  99        7439-89-6
Mn                 0.5 -   5        7439-96-5
Si                 0.1 -   3        7440-21-3
Al                 0   -   1        7429-90-5
B                  0   -   1        7440-42-8
Ca                 0   -   1        7440-70-2
Cr                 0   -   1        7440-47-3
Cu                 0   -   1        7440-50-8
Misch metal        0   -   1        8049-20-5
Mo                 0   -   1        7439-98-7
Nb                 0   -   1        7440-03-1
Ni                 0   -   1        7440-02-0
Ti                 0   -   1        7440-32-6
V                  0   -   1        7440-62-2
W                  0   -   1        7440-33-7
Zr                 0   -   1        7440-67-7
C                  0   -   0.5      7440-44-0
P                  0   -   0.5      7723-14-0

IPCI C23C0002-06 [I]; C21D0009-46 [I]; C22C0018-00 [I]; C22C0038-00 [I];
     C22C0038-58 [I]; C23C0002-02 [I]; C23C0002-28 [I]
IPCR C23C0002-06 [I]; C21D0009-46 [I]; C22C0018-00 [I]; C22C0038-00 [I];
     C22C0038-58 [I]; C23C0002-02 [I]; C23C0002-28 [I]
CC   55-6 (Ferrous Metals and Alloys)
ST   hot dip galvanized steel base silicon manganese wettability adhesion;
     steel annealing soaking hot dip galvanizing base sheet hardness
IT   Galvanized steel
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (hot-dip; manuf. of hot-dip galvanized steel sheet contg. Si
        and Mn in base steel sheet and showing good wettability and
        plating adhesion)
IT   Alloying
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Annealing
Hot-dip galvanizing
(manuf. of hot-dip galvanized steel sheet contg. Si and Mn in base steel sheet and showing good wettability and plating adhesion)

IT Heat treatment
(soaking; manuf. of hot-dip galvanized steel sheet contg. Si and Mn in base steel sheet and showing good wettability and plating adhesion)

IT 124-38-9, Carbon dioxide, uses 630-08-0, Carbon monoxide, uses 7727-37-9, Nitrogen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(annealing atm.; manuf. of hot-dip galvanized steel sheet contg. Si and Mn in base steel sheet and showing good wettability and plating adhesion)

IT 7440-45-1D, Cerium, trace in alloy 12709-15-8D, Ce 0.02%, P 0.010%, Al 0.04%, processes 144920-07-0D, Ce 0.02%, P 0.019%, Al 0.05%, processes 1428957-53-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(base steel sheet; manuf. of hot-dip galvanized steel sheet contg. Si and Mn in base steel sheet and showing good wettability and plating adhesion)

IT 53881-87-1 109581-27-3 109581-29-5 723302-58-7 763111-21-3 1242002-97-6 1554190-57-6 1554190-62-3 1554190-66-7 1554190-71-4 1554190-72-5 1554190-73-6 1554190-78-1 1554190-82-7 1554190-84-9 1554190-88-3 1554190-90-7 1554190-95-2 1554190-99-6 1554191-01-3 1554191-06-8 1554191-11-5 1554191-14-8 1554191-17-1
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(galvanizing layer; manuf. of hot-dip galvanized steel sheet contg. Si and Mn in base steel sheet and showing good wettability and plating adhesion)

OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 69 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:1659555 CAPLUS Full-text
DOCUMENT NUMBER: 159:643708
TITLE: Steel sheet provided with Al-Zn-Si base anticorrosive coating offering sacrificial cathodic protection, method for production of a part using the sheet
INVENTOR(S): Allely, Christian; Chassagne, Julie; Corlu, Beril
PATENT ASSIGNEE(S): ArcelorMittal Investigacion y Desarrollo SL, Spain
SOURCE: PCT Int. Appl., 26pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2013156688	A1	20131024	WO 2012-FR149	20120417
CA 2870532	A1	20131024	CA 2012-2870532	20120417
CA 2870532	C	20161213		
AU 2012377741	A1	20141204	AU 2012-377741	20120417
AU 2012377741	B2	20160317		
CN 104302802	A	20150121	CN 2012-80073231	20120417
CN 104302802	B	20170412		
KR 2015008114	A	20150121	KR 2014-7032019	20120417
KR 1667131	B1	20161017		
EP 2839049	A1	20150225	EP 2012-722750	20120417
EP 2839049	B1	20171018		
MX 2014012626	A	20150511	MX 2014-12626	20120417
MX 358552	B	20180823		
JP 2015520797	T	20150723	JP 2015-506274	20120417
JP 6348105	B2	20180627		
KR 2016114735	A	20161005	KR 2016-7026204	20120417
ES 2652028	T3	20180131	ES 2012-722750	20120417
KR 2018017229	A	20180220	KR 2018-7003561	20120417

KR 1886611	B1	20180809			
EA 30016	B1	20180629	EA 2014-1136		20120417
BR 112014025697	B1	20201020	BR 2014-112014025697		20120417
ZA 2014007327	A	20170830	ZA 2014-7327		20141009
IN 2014CN07902	A	20160701	IN 2014-CN7902		20141028
IN 360628	B	20210309			
US 20150284861	A1	20151008	US 2015-14394885		20150617
US 10253418	B2	20190409			
PRIORITY APPLN. INFO.:			KR 2014-7032019	A3	20120417
			KR 2016-7026204	A3	20120417
			WO 2012-FR149	W	20120417

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2013156688	A1	Dead	20201201
CA 2870532	A1	Alive	20201121
CA 2870532	C	Alive	20201120
AU 2012377741	A1	Alive	20201120
AU 2012377741	B2	Alive	20201121
CN 104302802	A	Alive	20201121
CN 104302802	B	Alive	20201121
KR 2015008114	A	Alive	20201121
KR 1667131	B1	Alive	20201120
EP 2839049	A1	Indeterminate	20201106
EP 2839049	B1	Indeterminate	20201106
MX 2014012626	A	Alive	20201120
MX 358552	B	Alive	20201121
JP 6348105	B2	Alive	20201121
KR 2016114735	A	Alive	20201120
ES 2652028	T3	Alive	20201121
KR 2018017229	A	Alive	20201120
KR 1886611	B1	Alive	20201121
EA 30016	B1	Indeterminate	20210208
BR 112014025697	B1	Alive	20201120
US 20150284861	A1	Alive	20201121
US 10253418	B2	Alive	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention relates to a steel sheet provided with a coating offering sacrificial cathodic protection, comprising, wt.%: Zn 5-50, Si 0.1- 15, and optionally Mg up to 10 and up to 0.3 in terms of total content, of addnl. elements, as well as comprising a protective element selected from Sn 0.1-5, In 0.01-0.5 and combinations of same, the remainder consisting of Al. The invention also relates to a method for producing parts by hot or cold pressing and to the resulting parts.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
NIPPON STEEL CORP	2002			EP 1225246 A1	CAPLUS
POSCO	2009			US 20090238715 A1	
THYSSENKRUPP STEEL EURO	2011			WO 2011157690 A1	CAPLUS

IT 1173986-65-6
RL: NUU (Other use, unclassified); USES (Uses)
(steel sheet provided with Al-Zn-Si base anticorrosive coating offering sacrificial cathodic protection, method for prodn. of part using the sheet)

RN 1173986-65-6 CAPLUS

CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Cu	0 - 0.1	7440-50-8

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    Ni       0   -   0.1       7440-02-0
    P        0   -   0.1       7723-14-0

IPCI C23C0002-04 [I]; C23C0002-12 [I]; C23C0002-28 [I]; C21D0001-673 [I];
     C21D0008-02 [I]
IPCR C23C0002-04 [I]; C21D0001-673 [I]; C21D0008-02 [I]; C23C0002-12 [I];
     C23C0002-28 [I]
CC   56-3 (Nonferrous Metals and Alloys)
ST   steel anticorrosive coating cathodic protection aluminum zinc silicon
     alloy
IT   Anticorrosive coating materials
     Cathodic protection
        (steel sheet provided with Al-Zn-Si base anticorrosive
        coating offering sacrificial cathodic protection, method for
        prodn. of part using the sheet)
IT   1469993-24-5   1469993-25-6   1469993-26-7   1469993-27-8   1469993-28-9
     1469993-29-0   1469993-30-3
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (coating; steel sheet provided with Al-Zn-Si base
        anticorrosive coating offering sacrificial cathodic
        protection, method for prodn. of part using the sheet)
IT   1173986-65-6
     RL: NUU (Other use, unclassified); USES (Uses)
        (steel sheet provided with Al-Zn-Si base anticorrosive
        coating offering sacrificial cathodic protection, method for
        prodn. of part using the sheet)
IT   12597-69-2, Steel, uses   870820-47-6, 22MnB5
     RL: NUU (Other use, unclassified); USES (Uses)
        (substrate; steel sheet provided with Al-Zn-Si base
        anticorrosive coating offering sacrificial cathodic
        protection, method for prodn. of part using the sheet)
OS.CITING REF COUNT:     4     THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD
                                (4 CITINGS)


L15  ANSWER 70 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2013:1612663  CAPLUS Full-text
DOCUMENT NUMBER:         161:113844
TITLE:                   Result prediction of steel carbonization when
                         carbonitriding
AUTHOR(S):               Gliner, R. E.; Vybornov, V. V.; Pryanichnikov, V. A.
CORPORATE SOURCE:        Nizhegorodskii Gosudarstvennyi Tekhnicheskii
                         Universitet, Nizhny Novgorod, Russia
SOURCE:                  Tekhnologiya Metallov (2013), (4), 8-14
                         CODEN: TMEEAL; ISSN: 1684-2499
PUBLISHER:               OOO "Nauka i Tekhnologii"
DOCUMENT TYPE:           Journal
LANGUAGE:                Russian
AB   The features of the steel during carburizing carbonitriding to the
     coeffs. of absorption and diffusion of carbon.  Revealed that complete
     satn. of carbon and nitrogen results in a significant acceleration of the
     absorption of carbon and, correspondingly, the speed of the carburizing.
     The possibility of harmonization of different carburizing alloy steels.
IT   56995-50-7, 20KhGR
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (result prediction of steel carburization during
        carbonitriding)
RN   56995-50-7  CAPLUS
CN   Iron alloy, base, Fe 96-98,Cr 0.75-1.05,Mn 0.70-1.00,Si 0.17-0.37,Cu
     0-0.30,Ni 0-0.30,C 0.18-0.24,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S
     0-0.035,Ti 0-0.03,B 0.001 (20KhGR)  (CA INDEX NAME)

Component        Component          Component
                  Percent         Registry Number
=========+=====================+================
    Fe         96    -  98          7439-89-6
    Cr          0.75 -   1.05        7440-47-3
    Mn          0.70 -   1.00        7439-96-5
    Si          0.17 -   0.37        7440-21-3
    Cu          0    -   0.30        7440-50-8
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    Ni          0    -   0.30          7440-02-0
    C           0.18 -   0.24          7440-44-0
    W           0    -   0.20          7440-33-7
    Mo          0    -   0.15          7439-98-7
    V           0    -   0.05          7440-62-2
    P           0    -   0.035         7723-14-0
    S           0    -   0.035         7704-34-9
    Ti          0    -   0.03          7440-32-6
    B                0.001             7440-42-8

CC   55-7 (Ferrous Metals and Alloys)
ST   carbonitriding steel carburization prediction
IT   Absorptivity
     Carbonitriding
     Composition
     Diffusion
     Diffusion coating process
        (result prediction of steel carburization during
        carbonitriding)
IT   74-82-8, Methane, uses   7664-41-7, Ammonia, uses
     RL: NUU (Other use, unclassified); USES (Uses)
        (result prediction of steel carburization during
        carbonitriding)
IT   39467-50-0, 20KhGNM, processes   56995-50-7, 20KhGR
     71390-26-6, 07Kh3GNM   859843-24-6, 20Kh3N3MFBA
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (result prediction of steel carburization during
        carbonitriding)


L15  ANSWER 71 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2013:1460865  CAPLUS Full-text
DOCUMENT NUMBER:         159:503793
TITLE:                   Hot-pressed zinc-nickel alloy-coated steel article
                         and its manufacture
INVENTOR(S):             Nakajima, Seiji; Miyoshi, Tatsuya; Ando, Satoru
PATENT ASSIGNEE(S):      JFE Steel Corp., Japan
SOURCE:                  Jpn. Kokai Tokkyo Koho, 11 pp.
                         CODEN: JKXXAF
DOCUMENT TYPE:           Patent
LANGUAGE:                Japanese
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    ---------------------    --------
     JP 2013185184        A    20130919    JP 2012-49868            20120307
PRIORITY APPLN. INFO.:                    JP 2012-49868            20120307
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     --------------      ----  -------------   -----------
     JP 2013185184        A    Alive           20201121
AB   The hot-pressed article has a plating layer satisfying total deposition
     of Zn and Ni 5-90 g/m2 and Ni deposition ratio based on the total
     deposition 10-25 wt.% on a steel sheet surface and comprises
     high-strength parts having tensile strength ≥1000 MPa and
     low-strength parts having tensile strength <1000 Pa.  The article is
     manufd. by heating a steel sheet contg. C 0.15-0.5, Si 0.05-2.0, Mn
     0.5-3, P ≤0.1, S ≤0.05, Al ≤0.1, and N ≤0.01
     wt.% coated with 5-90 g/m2 of Zn-(10-25 wt.%) Ni alloy to have
     coexistence of high-temp. parts at ≥ Ac3 transformation point and
     ≤1000° and low-temp. parts at ≥0° and < Ac3
     transformation point and then starting hot-pressing when the high-temp.
     parts become 600-800°.  The article has excellent resistance to
     corrosion and chipping after coating and is suitable for automotive parts.
IT   1356847-15-8D, Sb(0.003-0.03%)
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (hot-pressed zinc-nickel alloy-coated steel article
        having high-strength parts and low-strength parts and its manuf. by
        heating coated steel sheet and hot-pressing)
RN   1356847-15-8  CAPLUS
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CN Iron alloy, base, Fe 93-99,Mn 0.5-3,Si 0-2,Cr 0-1,C 0.2-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

IPCI C25D0005-26 [I]; C22C0038-00 [I]; C21D0009-00 [I]; C22C0038-60 [I]; C21D0001-18 [I]
IPCR C25D0005-26 [I]; C21D0001-18 [I]; C21D0009-00 [I]; C22C0038-00 [I]; C22C0038-60 [I]
CC 55-11 (Ferrous Metals and Alloys)
ST zinc nickel alloy coated steel heating hot pressing
IT Heat treatment
Hot-press molding
Metal forming
(hot-pressed zinc-nickel alloy-coated steel article having high-strength parts and low-strength parts and its manuf. by heating coated steel sheet and hot-pressing)
IT 7440-36-0D, Antimony, trace in alloy 238084-01-0 1299468-35-1 1356847-15-8D, Sb(0.003-0.03%)
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hot-pressed zinc-nickel alloy-coated steel article having high-strength parts and low-strength parts and its manuf. by heating coated steel sheet and hot-pressing)
IT 1379822-01-1
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(primer; hot-pressed zinc-nickel alloy-coated steel article having high-strength parts and low-strength parts and its manuf. by heating coated steel sheet and hot-pressing)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 72 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:1372467 CAPLUS Full-text
DOCUMENT NUMBER: 160:388074
TITLE: Improvement of the adhesive wear resistance and mechanical properties of low-carbon steel by solid carbonization
AUTHOR(S): Dabo, M. Noor I.; Aldlemey, M. S.
CORPORATE SOURCE: Technical College of Mechanical Engineering, Bengasi, Libya
SOURCE: Key Engineering Materials (2013), 553, 81-86, 7 pp.
CODEN: KEMAEY; ISSN: 1662-9795
DIGITAL OBJECT ID: 10.4028/www.scientific.net/KEM.553.81
PUBLISHER: Trans Tech Publications Ltd.
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English
AB Wear is one of the problems that occurs in moving parts, whether rolling or sliding. Since the wear resistance is closely linked to the hardness of the involved surfaces, this research studies the possibility of increasing the hardness of low carbon steel, which is used extensively because its ductility and its shock resistance and being one of the inexpensive metals. A lot of mech. parts require an external hard surface, resistant to wear, and at the same time high resistance to shocks. The main hardening process used in this research is the increase of the carbon proportion on the external surfaces of the equipment made of low carbon steel and thus, to make the heat treatments necessary to obtain the required properties of these surfaces such as hardness and high

resistance to shocks. The study of the process of carbonization by using the solid carbonization as one of the ways of hardening the surface at temps. in the austenite range of low carbon steels give an impression about the possibility of improvement in the qualities of hardness and resistance to wear. In order to obtain a variable thickness of the carbonated layer, a carbonization process was performed at different temps. and times to demonstrate the effect of these two important factors to the amt. of diffused carbon to the surface of the solid and thus the extent of its influence to obtain the required properties of the process. The mech. and microscopic tests conducted on samples proved the success of the carbonization process to achieve the purpose and goal of the prepn. of this paper. Finally exptl. results have shown good correlation between the wear resistance and mech. properties with temp. and carbonization time. The anal. of the variance of the results in this study indicated that the best mech. properties are achieved when one performs the process of carbonization at 975°C for 20 h.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Akdemir, A	2009	516	119	Materials Science an	
Akita, M	2006	200	6073	Surface and Coating	CAPLUS
Baldissera, P	2009	30	1435	Material and Design	CAPLUS
Celik, O	2003	43	1274	ISIJ International	CAPLUS
Michal, G	2006	54	1597	Acta Materialia	CAPLUS
Preciado, M	2006	176	41	Journal of Material	CAPLUS
Yang, C	1995	73	18	Surface and Coating	CAPLUS

IT 12604-89-6, A514A, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(improvement of adhesive wear resistance and mech. properties of low-carbon steel by solid carbonization)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3
Mo	0.18 - 0.28	7439-98-7
C	0.15 - 0.21	7440-44-0
Zr	0.05 - 0.15	7440-67-7
S	0 - 0.04	7704-34-9
P	0 - 0.035	7723-14-0
B	0 - 0.0025	7440-42-8

CC 55-10 (Ferrous Metals and Alloys)
ST steel solid carbonization adhesive wear resistance mech property
IT Wear
(adhesive; improvement of adhesive wear resistance and mech. properties of low-carbon steel by solid carbonization)
IT Carbonization
Case hardening
Diffusion
Elongation at break
Heat treatment
Temperature
Toughness
Vickers hardness
Wear resistance
(improvement of adhesive wear resistance and mech. properties of low-carbon steel by solid carbonization)
IT Tensile strength
(ultimate; improvement of adhesive wear resistance and mech. properties of low-carbon steel by solid carbonization)
IT 12604-89-6, A514A, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(improvement of adhesive wear resistance and mech. properties of

low-carbon steel by solid carbonization)

L15 ANSWER 73 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:1242975 CAPLUS Full-text
DOCUMENT NUMBER: 160:504640
TITLE: Gasoabrasive wear resistance at elevated temperatures of coatings produced by thermal spraying
AUTHOR(S): Pokhmursky, V. I.; Student, M. M.; Pokhmurskaya, A. V.; Ryabtsev, I. A.; Gvozdetsky, V. M.; Stupnitsky, T. R.
CORPORATE SOURCE: H.V. Karpenko Physico-Mechanical Institute, NASU, Lvov, 79601, Ukraine
SOURCE: Paton Welding Journal (2013), (6), 15-22
CODEN: PWJAAQ; ISSN: 0957-798X
PUBLISHER: International Association "Welding"
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Thermal spraying is becoming ever wider accepted to produce reconditioning and protective coatings for various functional purposes. However, service life of such coatings has not been studied well-enough so far. This work is a study of the mechanism of formation of elec. arc sprayed coatings from flux-cored wires of Fe-Cr-B-Al alloying system. It is found that gasoabrasive wear resistance of coatings from flux-cored wires depends on coating hardness, stresses of the first kind in the coating and on compn. of oxide films, which form at spraying and at elevated temps. during gasoabrasive wear testing. Oxide films initially form on the drop surface during spraying. In addn., in air the porous elec. arc sprayed coatings are found to have oxidn. on the surface and inside the coating (interlamellar oxidn.) and oxidn. on the boundary between the coating and steel base. It is shown that the high resistance to gasoabrasive wear is obsd. in coating, in which tensile stresses are transformed into compressive stresses as a result of the process of inner interlamellar oxidn. during isothermal soaking at testing temp. of 400-600 °C, leading to increase of coating vol. and improvement of its cohesion strength as a result of its reinforcement by interlamellar films of 100-150 nm thickness. Optimum content of alloying elements and their influence on gasoabrasive wear resistance of coatings are detd. Pos. influence of residual compressive stresses in the coatings on gasoabrasive wear is shown. Proposed coatings will become applied in power engineering enterprises. 13 Ref., 1 Table, 12 Figures.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Babichev, M	1955			Methods for determin	
Badish, E	2010	2	214	Tribology Int	
Borisov, Y	1995	4	3	Avtomatich Svarka	
Borisov, Y	1996	5	21	Avtomatich Svarka	
Borisova, A	1991	9	66	Avtomatich Svarka	
Branagan, D	2002	6	855	Composites	
Branagan, D	2001	32	2615	Met and Mater Trans	
Branagan, D	2001		111	Powder metallurgy al	
Dallaire, C	2001	10	337	J Thermal Spray Tech	
Korobov, Y	2002	2	16	Svarshchik	
Pokhmurska, H	2008		338	Proc of Int Thermal	
Pokhmursky, V	2005			Reconditioning and p	
Student, M	2009	45	481	Materials Sci	CAPLUS

IT 1338350-27-8, PP-500Kh20R5M10V10B10G5S2
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(gasoabrasive wear resistance at elevated temps. of coatings produced by thermal spraying)
RN 1338350-27-8 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (EnDOtec DO390N) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	33 - 100	7439-89-6
Cr	0 - 20	7440-47-3

Mo	0	-	10	7439-98-7
Nb	0	-	10	7440-03-1
W	0	-	10	7440-33-7
B	0	-	5	7440-42-8
C	0	-	5	7440-44-0
Mn	0	-	5	7439-96-5
Si	0	-	2	7440-21-3

CC 57-7 (Ceramics)
ST gasoabrasive wear resistance coating thermal spraying temp
IT Welding electrodes
(flux-cored arc welding electrodes; gasoabrasive wear resistance at elevated temps. of coatings produced by thermal spraying)
IT Coating materials
Corrosion resistance
Elasticity
Films
Mechanical hardness
Oxidation
Tension
Thermal spray coating process
Wear resistance
(gasoabrasive wear resistance at elevated temps. of coatings produced by thermal spraying)
IT 7429-90-5, Aluminum, processes 7440-47-3, Chromium, processes 12069-32-8, Boron carbide 198574-15-1, PP-Kh29R4S2G2 1338350-27-8, PP-500Kh20R5M10V10B10G5S2 1584688-44-7, Iron alloy, (PP-70V6R3Yu6) 1584688-75-4, Iron alloy, (PP-70Kh6R3Yu6) 1584688-79-8, Iron alloy, (PP-Kh30M15Yu4) 1584688-82-3, Iron alloy, (PP-Kh6R3Yu14) 1584688-95-8, Iron alloy, (PP-Kh6R3Yu2) 1584689-06-4, Iron alloy, (PP-Kh6R3Yu6)
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(gasoabrasive wear resistance at elevated temps. of coatings produced by thermal spraying)
IT 107477-54-3, Chromium iron boride ((Cr,Fe)2B) 716319-54-9, FKhB-2
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(gasoabrasive wear resistance at elevated temps. of coatings produced by thermal spraying)

L15 ANSWER 74 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:1179519 CAPLUS Full-text
DOCUMENT NUMBER: 160:283136
TITLE: The corrosion resistance of 140MXC, 530AS and 560AS coatings produced by thermal spraying
AUTHOR(S): Covaleda, E. A. Lopez; Florez, J. J. Olaya
CORPORATE SOURCE: Universidad Nacional de Colombia, Colombia
SOURCE: Ingenieria e Investigacion (2013), 33(1), 23-28
CODEN: IINNAC; ISSN: 0120-5609
PUBLISHER: Universidad Nacional de Colombia, Facultad de Ingenieria
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Three com. materials were deposited using elec. arc thermal spraying: 140MXC (with Fe, W, Cr, Nb), 530AS (AISI 1015 steel) and 560AS (AISI 420 steel) on AISI 4340 steel. The aim of this paper was to evaluate the best strategy for improving a coating-substrate system's corrosion resistance, using the following combinations: homogeneous single coatings, bilayers consisting of 530AS or 560AS under 140MXC and 140MXC + 530AS and 140MXC + 560AS coatings deposited simultaneously. The coatings were characterised using optical microscopy, SEM and X-ray diffraction. Corrosion resistance was evaluated through potentiodynamic polarisation and hardness by using the Vickers test. Corrosion resistance depends on the amt. of microstructure defects, the deposition strategy and the alloy elements. However, corrosion resistance was similar in single coatings of 140MXC and bilayers, having -630 V corrosion potential and 708 nA corrosion current. The details and corrosion mechanism of the coatings so produced are described in this paper.
RETABLE

Referenced Author	Year	VOL	PG	Referenced Work	Referenced

(RAU)	(RPY)	(RVL)	(RPG)	(RWK)	File
ASM	1990			Properties and selec	
ASM International	2004			Handbook of thermal	
Astm	2010			G3-89(2010) Standard	
Astm	2007	E407	23	Standard practice fo	
Cheng, Y	2003	48	1521	Electrochimica Acta	CAPLUS
Deshpande, S	2006	200	5395	Surface and Coatings	CAPLUS
Dimate Castellanos, L	2011			Produccion y resiste	
Edrisy, A		146-1	571	Surface and Coatings	CAPLUS
Edrisy, A	2002	420-4	338	Thin Solid Films	CAPLUS
Edrisy, A	2001	251	1023	Wear	
Eutectic, C	2007			Techinical data ARC	
Eutectic, C	2008			Technical data ARC 5	
Jin, G	2007	201	5261	Surface and Coatings	CAPLUS
Lin, B	2009	19	1556	Transactions of Nonf	CAPLUS
Mellali, M	1997	6	217	Journal of Thermal S	CAPLUS
Newbery, A	2006	178	259	Journal of Materials	CAPLUS
Patel, K	2010	204	3567	Surface and Coatings	CAPLUS
Praxair Surface t and T	2006			Praxair and Tafa 140	
Rabiei, A	1999	269	152	Materials Science an	
Syddorak, V	2002	38	3	Materials science	
Valencia, A	1986			Tecnologia del trata	
Wang, Y	2005	485	141	Thin Solid Films	CAPLUS

IT 916826-46-5, 140MXC
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating, composite; corrosion resistance of 140MXC, 530AS and 560AS coatings produced by thermal spraying)
RN 916826-46-5 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 40	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 9	7440-03-1
W	0 - 9	7440-33-7
B	0 - 5	7440-42-8
Mn	0 - 5	7439-96-5
C	0 - 4	7440-44-0
Si	0 - 2	7440-21-3

CC 55-10 (Ferrous Metals and Alloys)
ST steel coating thermal spraying corrosion resistance hardness
IT Bilayer films
Corrosion resistance
Electric current-potential relationship
Metal matrix composites
Microstructure
Nanocomposites
Thermal spray coating process
(corrosion resistance of 140MXC, 530AS and 560AS coatings produced by thermal spraying)
IT Chemically resistant coating materials
(oxidation-resistant; corrosion resistance of 140MXC, 530AS and 560AS coatings produced by thermal spraying)
IT 7439-89-6, Iron, processes 7440-03-1, Niobium, processes 7440-33-7, Tungsten, processes 7440-47-3, Chromium, processes 12725-34-7, AISI 1015, processes 37241-55-7, AISI 420 916826-46-5, 140MXC
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating, composite; corrosion resistance of 140MXC, 530AS and 560AS coatings produced by thermal spraying)
IT 12631-59-3, AISI 4340
RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(substrate; corrosion resistance of 140MXC, 530AS and 560AS

coatings produced by thermal spraying)

L15 ANSWER 75 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:781644 CAPLUS Full-text
DOCUMENT NUMBER: 159:643243
TITLE: Degradation Behavior of Nanostructured Coatings Deposited by High-Velocity Arc Spraying Process in an Actual Environment of a Coal-Fired Boiler
AUTHOR(S): Shukla, V. N.; Jayaganthan, R.; Tewari, V. K.
CORPORATE SOURCE: Department of Metallurgical and Materials Engineering & Centre of Nanotechnology, Indian Institute of Technology Roorkee, Roorkee, 247667, India
SOURCE: JOM (2013), 65(6), 784-791
CODEN: JOMMER; ISSN: 1047-4838
DIGITAL OBJECT ID: 10.1007/s11837-013-0612-5
PUBLISHER: Springer
DOCUMENT TYPE: Journal; (online computer file)
LANGUAGE: English

AB FeCr-based nanostructured coatings were deposited on a 301S stainless steel substrate by the high-velocity arc spraying process in the current work. The oxidn. behavior of the coatings exposed to elevated temps. (700°C and 900°C) under lab. conditions as well as in an actual industrial environment of a coal-fired boiler (at 700 ± 10°C) was investigated. X-ray diffraction, SEM/energy-dispersive anal., and transmission electron microscopy techniques were used to characterize the coating as well as to analyze the corrosion products for elucidating the corrosion mechanisms. The microhardness of the coating was found to be 520-1100 HV. The (FeCr)-based nanostructured coating showed good adherence to the 310S substrate and excellent oxidn. resistance during the exposures with no tendency for spallation of its oxide scales in both environments. The nanosized grain morphol. of the coating facilitated the formation of protective scales, which is continuous, adherent, and nonporous due to the higher diffusivity of alloying elements in the coatings. It precludes high-temp. oxidn. by acting as a diffusion barrier between the environment and the coating.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Barbezat, G	1993	162-1	529	Wear	CAPLUS
Buchanan, V	2009	203	3638	Surf Coat Technol	CAPLUS
Chatha, S	2012	200	4212	Surf Coat Technol	
Cheng, J	2009	355	1673	J Non-Cryst Solids	CAPLUS
Collins, S	1993	137	51	Power	CAPLUS
He, J	2001	10	293	J Therm Spray Techno	CAPLUS
Hussain, N	1994	41	251	J Oxid Met	CAPLUS
Kamal, S	2009	472	378	J Alloy Compd	CAPLUS
Kamal, S	2009	203	1004	Surf Coat Technol	CAPLUS
Kaur, M	2008	18	619	J Therm Spray Techno	
Kaur, M	2011	206	530	Surf Coat Technol	CAPLUS
Liu, G	2001	46	99	Mater Charact	CAPLUS
Ma, L	2010	20	201	Trans Nonferrous Met	
Matthews, S	2003	51	4267	Acta Mater	CAPLUS
Murthy, J	2006	200	2643	Surf Coat Technol	
Schuh, C	2007	55	4067	Acta Mater	CAPLUS
Shukla, V	2012	585	483	Adv Mater Res	CAPLUS
Sidhu, B	2006	172	52	J Mater Process Tech	CAPLUS
Sidhu, B	2004	368	149	Mater Sci Eng A	
Sidhu, T	2006	15	811	J Therm Spray Techno	CAPLUS
Sidhu, T	2006	201	273	Surf Coat Technol	CAPLUS
Staia, M	2001	146-1	563	Surf Coat Technol	CAPLUS
Wang, B	1996	199	24	Wear	CAPLUS
Wang, B	2001	250	755	Wear	
Wang, D	1988	36	49	Surf Coat Technol	CAPLUS

IT 1469977-80-7, Boron 0-5, carbon 0-4, chromium 0-25, iron 28-100, manganese 0-3, molybdenum 0-6, niobium 0-12, silicon 0-2, tungsten 0-15
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(degrdn. behavior of nanostructured coatings deposited by high-velocity arc spraying process in actual environment of coal-fired boiler)

RN 1469977-80-7 CAPLUS
CN Iron alloy, base, Fe 28-100,Cr 0-25,W 0-15,Nb 0-12,Mo 0-6,B 0-5,C 0-4,Mn 0-3,Si 0-2 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	28 - 100	7439-89-6
Cr	0 - 25	7440-47-3
W	0 - 15	7440-33-7
Nb	0 - 12	7440-03-1
Mo	0 - 6	7439-98-7
B	0 - 5	7440-42-8
C	0 - 4	7440-44-0
Mn	0 - 3	7439-96-5
Si	0 - 2	7440-21-3

CC 55-6 (Ferrous Metals and Alloys)
ST steel nanostructure coating degrdn HVAS coal fired boiler environment
IT Cables and Wires
Coal-fired boilers
Coating materials
Corrosion
Decomposition
Diffusion barrier
Erosion (wear)
Fly ash
Grain size
Microhardness
Microstructure
Nanostructures
Oxidation resistance
Spray coating process
Thermal analysis
(degrdn. behavior of nanostructured coatings deposited by high-velocity arc spraying process in actual environment of coal-fired boiler)
IT Scale (deposits)
(oxide; degrdn. behavior of nanostructured coatings deposited by high-velocity arc spraying process in actual environment of coal-fired boiler)
IT 37301-67-0, 310S
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(degrdn. behavior of nanostructured coatings deposited by high-velocity arc spraying process in actual environment of coal-fired boiler)
IT 1469977-80-7, Boron 0-5, carbon 0-4, chromium 0-25, iron 28-100, manganese 0-3, molybdenum 0-6, niobium 0-12, silicon 0-2, tungsten 0-15
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(degrdn. behavior of nanostructured coatings deposited by high-velocity arc spraying process in actual environment of coal-fired boiler)
OS.CITING REF COUNT: 5 THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD (5 CITINGS)

L15 ANSWER 76 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:650770 CAPLUS Full-text
DOCUMENT NUMBER: 158:624577
TITLE: Anti-scale and anti-corrosion hybrid coatings for steel substrates
INVENTOR(S): Gordon, Douglas Jesus Figueroa; Harding, Tim; Boehm, Sivasambu; Li, Wu; Weirman, Chris
PATENT ASSIGNEE(S): Tata Steel UK Limited, UK
SOURCE: PCT Int. Appl., 15pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

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     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     WO 2013056847        A1   20130425    WO 2012-EP4384           20121019
PRIORITY APPLN. INFO.:                     EP 2011-8421         A   20111019
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  -------------   -----------
     WO 2013056847        A1   Dead            20201201
AB   Method of producing a coated steel substrate suitable for hot-forming
     or other high temp. applications, which comprises the steps of: (i)
     providing a steel substrate; (ii) prepg. a coating mixt. comprising a
     curable org. component as a first binder, a curable inorg. component as a
     second binder, a cross- linking component to chem. cross-link the curable
     org. component and the curable inorg. component, and a metal or metal
     alloy particle having an aluminum content of at least 50% and a balance of
     50% or less of a non-aluminum metal; (iii) applying the mixt. on the
     steel substrate; (iv) curing the mixt. to produce a dense network
     structure of the coating on the steel substrate.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
Cornelis, V            |2010 |     |      |WO 2010069588 A1    |CAPLUS
Foscante Raymond E     |1981 |     |      |US 4250074 A        |CAPLUS
Gen Electric           |2007 |     |      |WO 2007067203 A1    |CAPLUS
Harding, T             |2011 |     |      |WO 2011069663 A2    |CAPLUS
Savin Ronald Richard   |1990 |     |      |EP 0385880 A2       |CAPLUS
Standke Burkhard       |2010 |     |      |US 20100159144 A1   |
IT   1431293-40-1, Aluminum 0-0.1, boron 0-0.1, carbon 0.2-0.5,
     chromium 0-1, iron 92-99, manganese 0.5-3, molybdenum 0-0.5, niobium
     0-0.1, phosphorus 0-0.1, silicon 0.1-2.5, titanium 0-0.2, vanadium 0-0.1
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (antiscale and anticorrosion hybrid coatings for
        steel substrates)
RN   1431293-40-1  CAPLUS
CN   Iron alloy, base, Fe 92-99,Mn 0.5-3,Si 0.1-2.5,Cr 0-1,C 0.2-0.5,Mo
     0-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1,V 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     92   -  99        7439-89-6
    Mn      0.5 -   3        7439-96-5
    Si      0.1 -   2.5      7440-21-3
    Cr      0   -   1        7440-47-3
    C       0.2 -   0.5      7440-44-0
    Mo      0   -   0.5      7439-98-7
    Ti      0   -   0.2      7440-32-6
    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    Nb      0   -   0.1      7440-03-1
    P       0   -   0.1      7723-14-0
    V       0   -   0.1      7440-62-2

IPCI C21D0001-68 [I]; C23C0018-02 [I]; C09D0007-12 [I]; C09D0005-10 [I];
     C09D0201-10 [I]; C09D0175-04 [I]; C09D0183-04 [I]
IPCR C21D0001-68 [I]; C09D0005-10 [I]; C09D0007-12 [I]; C09D0175-04 [I];
     C09D0183-04 [I]; C09D0201-10 [I]; C23C0018-02 [I]
CC   55-6 (Ferrous Metals and Alloys)
ST   antiscale anticorrosion hybrid coating steel
IT   Anticorrosive coating materials
     Antiscaling coating materials
     Binders
        (antiscale and anticorrosion hybrid coatings for
        steel substrates)
IT   Epoxy resins
     Organic compounds
     Silanes
     RL: NUU (Other use, unclassified); USES (Uses)
        (antiscale and anticorrosion hybrid coatings for
        steel substrates)
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IT Polyurethanes
RL: NUU (Other use, unclassified); USES (Uses)
(polyester-; antiscale and anticorrosion hybrid coatings for steel substrates)
IT Polyesters
RL: NUU (Other use, unclassified); USES (Uses)
(polyurethane-; antiscale and anticorrosion hybrid coatings for steel substrates)
IT 108-78-1, 1,3,5-Triazine-2,4,6-triamine, uses 661-20-1, Isocyanate 10344-93-1, Acrylate, uses
RL: NUU (Other use, unclassified); USES (Uses)
(antiscale and anticorrosion hybrid coatings for steel substrates)
IT 1273096-81-3, Aluminum alloy 1431293-40-1, Aluminum 0-0.1, boron 0-0.1, carbon 0.2-0.5, chromium 0-1, iron 92-99, manganese 0.5-3, molybdenum 0-0.5, niobium 0-0.1, phosphorus 0-0.1, silicon 0.1-2.5, titanium 0-0.2, vanadium 0-0.1
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(antiscale and anticorrosion hybrid coatings for steel substrates)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 77 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:640308 CAPLUS Full-text
DOCUMENT NUMBER: 158:593876
TITLE: High-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manufacture
INVENTOR(S): Okamoto, Isamu; Oka, Masaharu; Wakabayashi, Chisato; Azuma, Masafumi
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 24 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2013076137	A	20130425	JP 2011-217619	20110930
JP 5953693	B2	20160720		
PRIORITY APPLN. INFO.:			JP 2011-217619	20110930

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
JP 2013076137	A	Alive	20201121
JP 5953693	B2	Alive	20201120

AB The galvanized steel sheet has a steel substrate contg. C 0.05-0.4, Si 0.01-3.0, Mn 0.1-3.0, P ≤0.04, S ≤0.05, N ≤0.01, Al 0.01-2.0, and Si + Al >0.5 wt.% while having microstructure contg. ≥40 vol.% of ferrite main phase, ≥8 vol.% of retained austenite, 3 kinds of martensite defined by using C content and hardness, and 10-0 vol.% of pearlite, (1) a hot-dip galvanized layer contg. <7 wt.% Fe and residual amts. of Zn and Al or (2) a hot-dip galvannealed layer contg. 7-15 wt.% Fe and residual amts. of Zn and Alon the substrate, and tensile strength ≥980 MPa. The galvanized steel sheet is manufd. by heating a cast slab at ≥1100° directly or after cooling, final hot-rolling at ≥Ar3 transformation point, winding at ≤700°, pickling, cold-rolling at draft 40-70%, annealing at 730-900°, primary-cooling to 600-750° at rate 0.1-20°/s while satisfying (A) annealing temp. ≥730 and <800°, (B) primary cooling stopping temp. ≥600 and <700°, and/or (C) primary cooling av. rate 0.1-5.0°/s, cooling to ≤450° at rate ≥20°/s, holding at 350-450° for ≥120 s, cooling, grinding the surface layer in thickness ≥0.1 μm for removal, preplating with 0.2-2.0 g/m2 of Ni, heating at rate ≥10°/s to [(galvanizing bath temp.) - 40]° to [(galvanizing bath temp.) + 50]°, galvanizing, and optionally heat-alloying at 470-600° for 10-40 s.

IT 1430730-21-4D, Ca(0.0005-0.01%) Mg(0.0005-0.01%) rare earth metal(0.0005-0.01%)
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrate; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
RN 1430730-21-4 CAPLUS
CN Iron alloy, base, Fe 80-99,Mn 0.1-3,Cr 0-3,Cu 0-3,Ni 0-3,Si 0-3,Al 0-2,Mo 0-1,V 0-0.5,C 0-0.4,Nb 0-0.3,Ti 0-0.3,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	80 - 99	7439-89-6
Mn	0.1 - 3	7439-96-5
Cr	0 - 3	7440-47-3
Cu	0 - 3	7440-50-8
Ni	0 - 3	7440-02-0
Si	0 - 3	7440-21-3
Al	0 - 2	7429-90-5
Mo	0 - 1	7439-98-7
V	0 - 0.5	7440-62-2
C	0 - 0.4	7440-44-0
Nb	0 - 0.3	7440-03-1
Ti	0 - 0.3	7440-32-6
B	0 - 0.1	7440-42-8

IPCI C22C0038-00 [I]; C22C0038-60 [I]; C21D0009-46 [I]; C23C0002-06 [I]; C23C0002-28 [I]; C23C0002-40 [I]; C22C0038-00 [I]; C22C0038-60 [I]; C21D0009-46 [I]; C23C0002-06 [I]; C23C0002-28 [I]; C23C0002-40 [I]
IPCR C22C0038-00 [I]; C21D0009-46 [I]; C22C0038-60 [I]; C23C0002-06 [I]; C23C0002-28 [I]; C23C0002-40 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST hot dip galvanized steel sheet manuf plating adhesion formability
IT Annealing
Cold rolling
Cooling
Galvannealing
Grinding (machining)
Hot rolling
Hot-dip galvanizing
(high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT Rare earth metals
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(trace in alloy, substrate; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT 1431127-89-7
RL: TEM (Technical or engineered material use); USES (Uses)
(galvanized layer; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT 1430730-23-6
RL: TEM (Technical or engineered material use); USES (Uses)
(galvannealed layer; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT 7440-02-0, Nickel, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(precoating with; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT 12244-31-4, Austenite, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(retained, steel substrate microstructure component; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)
IT 12173-93-2, Martensite, uses 12427-24-6, Ferrite (ferrous metal component) 12427-27-9, Pearlite
RL: TEM (Technical or engineered material use); USES (Uses)
(steel substrate microstructure component; high-strength

hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)

IT 7439-95-4D, Magnesium, trace in alloy 7440-70-2D, Calcium, trace in alloy 1430730-20-3 1430730-21-4D, Ca(0.0005-0.01%) Mg(0.0005-0.01%) rare earth metal(0.0005-0.01%)
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrate; high-strength hot-dip galvanized steel sheet with excellent plating adhesion and formability and its manuf.)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 78 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:637081 CAPLUS Full-text
DOCUMENT NUMBER: 158:608421
TITLE: Hot-dip galvanized steel sheet with high tensile strength and excellent formability and its manufacture
INVENTOR(S): Wakabayashi, Chisato; Azuma, Masafumi; Okamoto, Riki; Fujita, Nobuhiro; Takahashi, Manabu
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 21 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2013076148	A	20130425	JP 2011-217995	20110930
JP 5699889	B2	20150415		
PRIORITY APPLN. INFO.:			JP 2011-217995	20110930

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
JP 2013076148	A	Alive	20201121
JP 5699889	B2	Alive	20201121

AB The galvanized steel sheet has a steel substrate contg. C 0.05-0.4, Si 0.01-3.0, Mn 0.1-3.0, P ≤0.04, S ≤0.05, N ≤0.01, Al 0.01-2.0, and Si + Al >0.5 wt.% while having microstructure contg. ≥40 vol.% total of main phase consisting of ≥1 kind of martensite selected from 3 kinds defined by using C content including cementite and hardness and bainite, ≥8 vol.% of austenite, ≤10 vol.% of pearlite, and a residual amt. of ferrite, (1) a hot-dip galvanized layer contg. <7 wt.% Fe and residual amts. of Zn and Al or (2) a hot-dip galvannealed layer contg. 7-15 wt.% Fe and residual amts. of Zn and Al on the substrate, and tensile strength ≥980 MPa. The galvanized steel sheet is manufd. by heating a cast slab at ≥1200° directly or after cooling, final hot-rolling at ≥Ar3 transformation point, winding at ≤700°, pickling, cold-rolling at draft 40-70%, annealing at 730-900°, primary-cooling to 650-750° at rate 0.1-50°/s, cooling to ≤450° at rate ≥20°/s, holding at 350-450° for ≥120 s, cooling, pickling, grinding the surface layer in thickness ≥0.1 μm for removal, preplating with 0.2-2.0 g/m2 of Ni, heating at rate ≥10°/s to [(galvanizing bath temp.) - 40]° to [(galvanizing bath temp.) + 50]°, galvanizing by dipping in a bath flowing at flow rate 10-50 m/min, and optionally heat-alloying at 470-600° for 10-40 s. The galvanized sheet shows good ductility and hole-expanding property.

IT 1431057-05-4D, Ca(0.0005-0.01%) Mg(0.0005-0.01%) rare earth metal(0.0005-0.01%)
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(substrate; hot-dip galvanized steel sheet with high tensile strength and excellent formability and its manuf.)

RN 1431057-05-4 CAPLUS
CN Iron alloy, base, Fe 86-100,Mn 0.1-3,Si 0-3,Al 0-2,Cr 0-1,Cu 0-1,Mo 0-1,Ni 0-1,V 0-0.5,C 0-0.4,Nb 0-0.3,Ti 0-0.3,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number

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=========+=============+================
    Fe      86    - 100         7439-89-6
    Mn       0.1 -   3          7439-96-5
    Si       0   -   3          7440-21-3
    Al       0   -   2          7429-90-5
    Cr       0   -   1          7440-47-3
    Cu       0   -   1          7440-50-8
    Mo       0   -   1          7439-98-7
    Ni       0   -   1          7440-02-0
    V        0   -   0.5        7440-62-2
    C        0   -   0.4        7440-44-0
    Nb       0   -   0.3        7440-03-1
    Ti       0   -   0.3        7440-32-6
    B        0   -   0.1        7440-42-8

IPCI C22C0038-00 [I]; C22C0038-06 [I]; C22C0038-58 [I]; C21D0009-46 [I];
     C22C0018-00 [I]; B21B0003-00 [I]; C23C0002-06 [I]; C23C0002-40 [I];
     C23C0002-02 [I]; C23C0002-28 [I]; C22C0038-00 [I]; C22C0038-60 [I];
     C21D0009-46 [I]; C22C0018-00 [I]; B21B0003-00 [I]; C23C0002-06 [I];
     C23C0002-40 [I]; C23C0002-02 [I]; C23C0002-28 [I]
IPCR C22C0038-00 [I]; B21B0003-00 [I]; C21D0009-46 [I]; C22C0018-00 [I];
     C22C0038-06 [I]; C22C0038-58 [I]; C23C0002-02 [I]; C23C0002-06 [I];
     C23C0002-28 [I]; C23C0002-40 [I]; C22C0038-60 [I]
CC   55-6 (Ferrous Metals and Alloys)
ST   hot dip galvanized steel sheet manuf tensile strength formability
IT   Annealing
     Cold rolling
     Cooling
     Galvannealing
     Grinding (machining)
     Hot rolling
     Hot-dip galvanizing
     Pickling
        (hot-dip galvanized steel sheet with high tensile strength
        and excellent formability and its manuf.)
IT   Recrystallization
        (texture; hot-dip galvanized steel sheet with high tensile
        strength and excellent formability and its manuf.)
IT   Rare earth metals
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (trace in alloy, substrate; hot-dip galvanized steel sheet
        with high tensile strength and excellent formability and its manuf.)
IT   1431127-89-7, (Aluminum + zinc) 93-100, iron 0-7
     RL: TEM (Technical or engineered material use); USES (Uses)
        (galvanized layer; hot-dip galvanized steel sheet
        with high tensile strength and excellent formability and its manuf.)
IT   1430730-23-6, (Aluminum + zinc) 85-93, iron 7-15
     RL: TEM (Technical or engineered material use); USES (Uses)
        (galvannealed layer; hot-dip galvanized steel sheet
        with high tensile strength and excellent formability and its manuf.)
IT   7440-02-0, Nickel, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (precoating with; hot-dip galvanized steel sheet with high
        tensile strength and excellent formability and its manuf.)
IT   12169-32-3, Cementite   12173-93-2, Martensite, uses   12244-31-4,
     Austenite, uses   12427-23-5, Bainite   12427-24-6, Ferrite (ferrous metal
     component)   12427-27-9, Pearlite
     RL: TEM (Technical or engineered material use); USES (Uses)
        (steel substrate microstructure component; hot-dip galvanized
        steel sheet with high tensile strength and excellent
        formability and its manuf.)
IT   7439-95-4D, Magnesium, trace in alloy   7440-70-2D, Calcium, trace in
     alloy   1428932-65-3   1431057-05-4D, Ca(0.0005-0.01%)
     Mg(0.0005-0.01%) rare earth metal(0.0005-0.01%)
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (substrate; hot-dip galvanized steel sheet with high tensile
        strength and excellent formability and its manuf.)
OS.CITING REF COUNT:     3     THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD
                               (3 CITINGS)
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L15 ANSWER 79 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:515313 CAPLUS Full-text
DOCUMENT NUMBER: 158:510556
TITLE: Steel sheet having hot-dip galvanized layer and exhibiting superior plating wettability and plating adhesion, and production method therefor
INVENTOR(S): Fujita, Soshi; Yamanaka, Shintaro; Sato, Koichi
PATENT ASSIGNEE(S): Nippon Steel & Sumitomo Metal Corporation, Japan
SOURCE: PCT Int. Appl., 66pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2013047804	A1	20130404	WO 2012-JP75189	20120928
CA 2848949	A1	20130404	CA 2012-2848949	20120928
CA 2848949	C	20160920		
KR 2014053322	A	20140507	KR 2014-7006759	20120928
KR 1624810	B1	20160526		
CN 103827342	A	20140528	CN 2012-80047145	20120928
CN 103827342	B	20160622		
MX 2014003789	A	20140710	MX 2014-3789	20120928
MX 359228	B	20180920		
EP 2762601	A1	20140806	EP 2012-835446	20120928
EP 2762601	B1	20180530		
TW I465581	B	20141221	TW 2012-135905	20120928
JP 5648741	B2	20150107	JP 2013-514485	20120928
RU 2584060	C2	20160520	RU 2014-117496	20120928
BR 112014007509	A2	20170404	BR 2014-112014007509	20120928
ES 2680649	T3	20180910	ES 2012-835446	20120928
IN 2014DN02028	A	20150313	IN 2014-DN2028	20140318
US 20140234656	A1	20140821	US 2014-14346618	20140321
US 9752221	B2	20170905		
ZA 2014002254	A	20150826	ZA 2014-2254	20140326
JP 2015038245	A	20150226	JP 2014-173185	20140827
JP 5907221	B2	20160426		

PRIORITY APPLN. INFO.:

JP 2011-217144	A	20110930
JP 2013-514485	A3	20120928
WO 2012-JP75189	W	20120928

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2013047804	A1	Dead	20201201
CA 2848949	A1	Alive	20201121
CA 2848949	C	Alive	20201121
KR 2014053322	A	Alive	20201121
KR 1624810	B1	Alive	20201120
CN 103827342	A	Alive	20201121
CN 103827342	B	Alive	20201120
MX 2014003789	A	Alive	20201121
MX 359228	B	Alive	20201120
EP 2762601	A1	Indeterminate	20201107
EP 2762601	B1	Indeterminate	20201106
TW I465581	B	Alive	20201121
JP 5648741	B2	Alive	20201121
RU 2584060	C2	Alive	20201121
BR 112014007509	A2	Dead	20210430
ES 2680649	T3	Alive	20201121
US 20140234656	A1	Alive	20201121
US 9752221	B2	Alive	20201121
JP 2015038245	A	Alive	20201120
JP 5907221	B2	Alive	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB Provided are a steel sheet that has a hot-dip galvanized layer and that exhibits superior plating wettability and plating adhesion, and a prodn. method therefor. A steel sheet contg. readily oxidizable elements including Si and Mn is used as a base material. The hot-dip galvanized steel sheet has a hot-dip galvanized layer (A) on the surface of the steel sheet and is characterized by having a (B) layer

that is directly under the surface of and inside of the steel sheet. The (B) layer has a thickness of 0.001 μm to 0.5 μm. By mass, the (B) layer contains 50 mass% or more of unoxidized Fe, less than 50 mass% total of one or more oxides of Fe, Si, Mn, P, S, and/or Al, and contains unoxidized C, Si, Mn, P, S, and/or Al in the following quantities: less than 0.05 mass% of C; less than 0.1 mass% of Si; less than 0.5 mass% of Mn; less than 0.001 mass% of P; less than 0.001 mass% of S; and less than 0.005 mass% of Al. The steel sheet has a compn. contg. C 0.05-0.50, Si 0.1-3.0, Mn 0.5-5.0, P 0.001-0.5, S 0.001-0.03, Al 0.005-1.0, and balance Fe and inevitable impurities.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
NKK Corp	2001			JP 2001200352 A	CAPLUS
Nippon Steel Corp	2001			JP 2001226742 A	CAPLUS
Nippon Steel Corp	2003			CN 101125473 A	CAPLUS
Nippon Steel Corp	2003			EP 1504134 A	CAPLUS
Nippon Steel Corp	2003			CN 1639375 A	CAPLUS
Nippon Steel Corp	2003			WO 2002101112 A2	CAPLUS
Nippon Steel Corp	2003			AU 2002304255 A	CAPLUS
Nippon Steel Corp	2003			JP 2003171752 A	CAPLUS
Nippon Steel Corp	2003			US 20040202889 A1	CAPLUS
Nippon Steel Corp	2003			KR 20070026882 A	
Nippon Steel Corp	2003			KR 20070026883 A	
Nippon Steel Corp	2003			US 20080035247 A1	CAPLUS
Nippon Steel Corp	2003			US 20090272467 A1	CAPLUS
Nippon Steel Corp	2003			BR 210265 A	
Nippon Steel Corp	2003			CA 2449604 A1	CAPLUS
Nippon Steel Corp	2003			TW 573021 B	CAPLUS
Nippon Steel Corp	2003			DE 60220191 D	
Nippon Steel Corp	2003			DE 60220191 T	

IT 1428957-53-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)

RN 1428957-53-2 CAPLUS

CN Iron alloy, base, Fe 78-99,Mn 0.5-5,Si 0.1-3,Al 0-1,B 0-1,Ca 0-1,Cr 0-1,Cu 0-1,misch metal 0-1,Mo 0-1,Nb 0-1,Ni 0-1,Ti 0-1,V 0-1,W 0-1,Zr 0-1,C 0-0.5,P 0-0.5 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	78 - 99	7439-89-6
Mn	0.5 - 5	7439-96-5
Si	0.1 - 3	7440-21-3
Al	0 - 1	7429-90-5
B	0 - 1	7440-42-8
Ca	0 - 1	7440-70-2
Cr	0 - 1	7440-47-3
Cu	0 - 1	7440-50-8
Misch metal	0 - 1	8049-20-5
Mo	0 - 1	7439-98-7
Nb	0 - 1	7440-03-1
Ni	0 - 1	7440-02-0
Ti	0 - 1	7440-32-6
V	0 - 1	7440-62-2
W	0 - 1	7440-33-7
Zr	0 - 1	7440-67-7
C	0 - 0.5	7440-44-0
P	0 - 0.5	7723-14-0

IPCI C23C0002-06 [I]; C22C0018-00 [I]; C22C0038-00 [I]; C22C0038-06 [I]; C22C0038-58 [I]; C23C0002-02 [I]; C23C0002-40 [I]

IPCR C23C0002-06 [I]; C22C0018-00 [I]; C22C0038-00 [I]; C22C0038-06 [I]; C22C0038-58 [I]; C23C0002-02 [I]; C23C0002-40 [I]

CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 56

ST hot dip galvanization steel sheet pretreatment annealing hydrogen atm

IT Water vapor

(annealing in atm. contg.; manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
IT Annealing
(in H-contg. atm.; manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
IT Cold rolling
Hot rolling
Hot-dip galvanizing
(manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
IT Controlled atmospheres
(reducing, annealing in; manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
IT 1333-74-0, Hydrogen, uses 7727-37-9, Nitrogen, uses 7732-18-5, Water, uses
RL: NUU (Other use, unclassified); USES (Uses)
(annealing in atm. contg.; manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
IT 1428957-52-1 1428957-53-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manuf. of hot-dip galvanized steel sheet by annealing cold rolled steel sheet in H-contg. atm. before galvanizing)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 80 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:241956 CAPLUS Full-text
DOCUMENT NUMBER: 158:308451
TITLE: Hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength, and method for their manufacture
INVENTOR(S): Kariya, Nobusuke; Kaneko, Shinjiro; Nagataki, Yasunobu
PATENT ASSIGNEE(S): JFE Steel Corporation, Japan
SOURCE: PCT Int. Appl., 29pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2013022010	A1	20130214	WO 2012-JP70130	20120801
JP 2013036069	A	20130221	JP 2011-171520	20110805
JP 5338873	B2	20131113		
CA 2844202	A1	20130214	CA 2012-2844202	20120801
CA 2844202	C	20170117		
KR 2014030333	A	20140311	KR 2014-7002890	20120801
MX 2014001360	A	20140321	MX 2014-1360	20120801
MX 362601	B	20190128		
CN 103732777	A	20140416	CN 2012-80038679	20120801
CN 103732777	B	20171024		
EP 2740813	A1	20140611	EP 2012-822499	20120801
EP 2740813	B1	20200422		
IN 2014CN00045	A	20140926	IN 2014-CN45	20140102
IN 340498	B	20200710		
US 20140220383	A1	20140807	US 2014-14131957	20140421
US 10337094	B2	20190702		

PRIORITY APPLN. INFO.: JP 2011-171520 A 20110805
WO 2012-JP70130 W 20120801

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2013022010	A1	Dead	20201202
JP 2013036069	A	Alive	20201120
JP 5338873	B2	Alive	20201121
CA 2844202	A1	Alive	20201121

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     CA 2844202           C    Alive           20201121
     KR 2014030333        A    Dead            20201121
     MX 2014001360        A    Alive           20201120
     MX 362601            B    Alive           20201121
     CN 103732777         A    Alive           20201120
     CN 103732777         B    Alive           20201121
     EP 2740813           A1   Indeterminate   20201106
     EP 2740813           B1   Indeterminate   20201106
     US 20140220383       A1   Alive           20201121
     US 10337094          B2   Alive           20201120
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The title hot-dip galvanized steel sheets, preferably, galvannealed
     steel sheets, useful for automobile parts, etc., contain 0.100-0.200
     wt.% C, ≤0.50 wt.% Si, ≤0.60 wt.% Mn, ≤0.100 wt.% P,
     ≤0.0100 wt.% S, 0.010-0.100 wt.% Al, ≤0.0100 wt.% N, and
     balance Fe, and have 60-79 area% ferrite phases with av. particle size
     ≤15 μm, 20-30 area% pearlite phases with av. particle size
     ≤10 μm, 1-5 area% bainite phases with av. particle size
     ≤5 μm, and ≤5 area% cementite phases in the ferrite
     phases.  The steel sheets may also contain ≥1 elements chosen
     from 0.05-0.80 wt.% Cr, 0.005-0.100 wt.% V, 0.005-0.500 wt.% Mo,0.01-0.10
     wt.% Cu, and 0.01-0.10 wt.% Ni, and/or 0.001-0.005 wt.% Ca and/or
     0.001-0.005 wt.% REM.  The title manufg. method involves heating steel
     slabs having the above compns., hot-rolling to end temp. of Ar3 point or
     above, winding the hot-rolled sheets at ≤600°, washing with
     acids, heating at ≥10°/s to ≥650°, annealing
     from 700° to (AC3 - 5)° for ≥10 s, quenching at
     10-200°/s to 300-500°, keeping at 300-500° for 30-300
     s, and hot-dip galvanizing.  Preferably, in the method, the acid-washed
     hot-rolled steel sheets are cold-rolled with draft 40-85% before the
     heating.
RETABLE
```

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
JFE Steel Corp	2003			JP 2003193188 A	CAPLUS
JFE Steel Corp	2009			CN 101688279 A	CAPLUS
JFE Steel Corp	2009			WO 2009008551 A1	CAPLUS
JFE Steel Corp	2009			JP 200935815 A	
JFE Steel Corp	2009			KR 20100023025 A	
JFE Steel Corp	2009			US 20100330392 A1	CAPLUS
JFE Steel Corp	2009			EP 2169091 A1	CAPLUS
JFE Steel Corp	2010			JP 2010255097 A	CAPLUS
Kobe Steel Ltd	2007			JP 2007107099 A	CAPLUS

```
IT   1422274-77-8, processes   1422274-77-8D,
     Ca(0.001-0.005) REM (0.001-0.005), processes
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (manuf. of hot-dip galvanized steel sheets having high
        ductility, stretch flangeability, and tensile strength)
RN   1422274-77-8  CAPLUS
CN   Steel, Fe 97-100,Cr 0-0.8,Mn 0-0.6,Mo 0-0.5,Si 0-0.5,C 0.1-0.2,B 0-0.2,Al
     0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1,V 0-0.1  (CA INDEX NAME)
```

Component	Component Percent	Component Registry Number
Fe	97 - 100	7439-89-6
Cr	0 - 0.8	7440-47-3
Mn	0 - 0.6	7439-96-5
Mo	0 - 0.5	7439-98-7
Si	0 - 0.5	7440-21-3
C	0.1 - 0.2	7440-44-0
B	0 - 0.2	7440-42-8
Al	0 - 0.1	7429-90-5
Cu	0 - 0.1	7440-50-8
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0
V	0 - 0.1	7440-62-2

```
RN   1422274-77-8  CAPLUS
CN   Steel, Fe 97-100,Cr 0-0.8,Mn 0-0.6,Mo 0-0.5,Si 0-0.5,C 0.1-0.2,B 0-0.2,Al
```

0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 100	7439-89-6
Cr	0 - 0.8	7440-47-3
Mn	0 - 0.6	7439-96-5
Mo	0 - 0.5	7439-98-7
Si	0 - 0.5	7440-21-3
C	0.1 - 0.2	7440-44-0
B	0 - 0.2	7440-42-8
Al	0 - 0.1	7429-90-5
Cu	0 - 0.1	7440-50-8
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0
V	0 - 0.1	7440-62-2

IPCI C22C0038-00 [I]; C21D0009-46 [I]; C22C0038-06 [I]; C22C0038-54 [I];
C23C0002-02 [I]; C23C0002-06 [I]; C23C0002-28 [I]; C22C0018-00 [N]
IPCR C22C0038-00 [I]; C21D0009-46 [I]; C22C0018-00 [N]; C22C0038-06 [I];
C22C0038-54 [I]; C23C0002-02 [I]; C23C0002-06 [I]; C23C0002-28 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST hot dip galvanized steel sheet ductility; stretch flangeability hot dip galvanized steel sheet; tensile strength hot dip galvanized steel sheet; galvannealed steel sheet automobile part; annealing cementite galvanized steel sheet; quenching bainite pearlite galvanized steel sheet; ferrite heat treatment galvanized steel sheet; galvanized steel sheet hot rolling
IT Heat treatment
(for thermal recrystn. of ferrite phases; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Galvanized steel
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hot-dip; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Annealing
Automobile parts
Cold rolling
Galvannealing
Hot rolling
Quenching (cooling)
(manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Recrystallization
(thermal, of ferrite phases; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Rare earth metals
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(trace in alloys; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT 51396-68-0DP, other metals
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(galvannealed layer; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT 7440-70-2D, Calcium, trace in alloy 12169-32-3, Cementite 12427-23-5, Bainite 12427-24-6, Ferrite (ferrous metal component) 12427-27-9, Pearlite 12791-75-2 39308-06-0 1422274-76-7, processes
1422274-76-7D, Ca(0.001-0.005) REM (0.001-0.005), processes
1422274-77-8, processes 1422274-77-8D, Ca(0.001-0.005)
REM (0.001-0.005), processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)

L15 ANSWER 81 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:241779 CAPLUS Full-text
DOCUMENT NUMBER: 158:337546
TITLE: Hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength, and method for their manufacture
INVENTOR(S): Kariya, Nobusuke; Kaneko, Shinjiro; Nagataki, Yasunobu
PATENT ASSIGNEE(S): JFE Steel Corporation, Japan
SOURCE: PCT Int. Appl., 30pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2013022008	A1	20130214	WO 2012-JP70128	20120801
JP 2013036071	A	20130221	JP 2011-171608	20110805
JP 5434984	B2	20140305		

PRIORITY APPLN. INFO.: JP 2011-171608 A 20110805
PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2013022008	A1	Dead	20201202
JP 2013036071	A	Alive	20201120
JP 5434984	B2	Alive	20201121

AB The title hot-dip galvanized steel sheets, preferably, galvannealed steel sheets, useful for automobile parts, etc., contain 0.100-0.200 wt.% C, ≤0.50 wt.% Si, ≤0.60 wt.% Mn, ≤0.100 wt.% P, ≤0.0100 wt.% S, 0.010-0.100 wt.% Al, ≤0.0100 wt.% N, and balance Fe, and have 50-87 area% ferrite phases with av. particle size ≤15 μm, 10-30 area% pearlite phases with av. particle size ≤10 μm, 3-10 area% bainite phases with av. particle size ≤5 μm, and ≤10 area% cementite phases in the ferrite phases. The steel sheets may also contain ≥1 elements chosen from 0.05-0.80 wt.% Cr, 0.005-0.100 wt.% V, 0.005-0.500 wt.% Mo,0.01-0.10 wt.% Cu, and 0.01-0.10 wt.% Ni, and/or 0.001-0.005 wt.% Ca and/or 0.001-0.005 wt.% REM. The title manufg. method involves heating steel slabs having the above compns., hot-rolling to end temp. of Ar3 point or above, winding the hot-rolled sheets at ≤600°, washing with acids, heating at ≥10°/s to ≥650°, annealing at ≥(AC3 + 5)° for ≥10 s, quenching at 10-200°/s to 100-300°, keeping at 100-300° for 30-300 s, and hot-dip galvanizing. Preferably, in the method, the acid-washed hot-rolled steel sheets are cold-rolled with draft 40-85% before the heating.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
JFE Steel Corp	2003			JP 2003193188 A	CAPLUS
JFE Steel Corp	2007			JP 2007138261 A	CAPLUS
JFE Steel Corp	2009			CN 101688279 A	CAPLUS
JFE Steel Corp	2009			WO 2009008551 A1	CAPLUS
JFE Steel Corp	2009			JP 200935815 A	
JFE Steel Corp	2009			KR 20100023025 A	
JFE Steel Corp	2009			US 20100330392 A1	CAPLUS
JFE Steel Corp	2009			EP 2169091 A1	CAPLUS
Kobe Steel Ltd	2007			JP 2007107099 A	CAPLUS
Nippon Steel Corp	2008			JP 2008202115 A	CAPLUS

IT 1422274-77-8, processes 1422274-77-8D, Ca(0.001-0.005) REM (0.001-0.005), processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
RN 1422274-77-8 CAPLUS
CN Steel, Fe 97-100,Cr 0-0.8,Mn 0-0.6,Mo 0-0.5,Si 0-0.5,C 0.1-0.2,B 0-0.2,Al 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1,V 0-0.1 (CA INDEX NAME)

Component Component Component

	Percent			Registry Number
Fe	97	-	100	7439-89-6
Cr	0	-	0.8	7440-47-3
Mn	0	-	0.6	7439-96-5
Mo	0	-	0.5	7439-98-7
Si	0	-	0.5	7440-21-3
C	0.1	-	0.2	7440-44-0
B	0	-	0.2	7440-42-8
Al	0	-	0.1	7429-90-5
Cu	0	-	0.1	7440-50-8
Ni	0	-	0.1	7440-02-0
P	0	-	0.1	7723-14-0
V	0	-	0.1	7440-62-2

RN 1422274-77-8 CAPLUS
CN Steel, Fe 97-100,Cr 0-0.8,Mn 0-0.6,Mo 0-0.5,Si 0-0.5,C 0.1-0.2,B 0-0.2,Al 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	100	7439-89-6
Cr	0	-	0.8	7440-47-3
Mn	0	-	0.6	7439-96-5
Mo	0	-	0.5	7439-98-7
Si	0	-	0.5	7440-21-3
C	0.1	-	0.2	7440-44-0
B	0	-	0.2	7440-42-8
Al	0	-	0.1	7429-90-5
Cu	0	-	0.1	7440-50-8
Ni	0	-	0.1	7440-02-0
P	0	-	0.1	7723-14-0
V	0	-	0.1	7440-62-2

IPCI C22C0038-00 [I]; C21D0009-46 [I]; C22C0018-00 [I]; C22C0038-06 [I]; C22C0038-54 [I]; C23C0002-02 [I]; C23C0002-06 [I]; C23C0002-28 [I]
IPCR C22C0038-00 [I]; C21D0009-46 [I]; C22C0018-00 [I]; C22C0038-06 [I]; C22C0038-54 [I]; C23C0002-02 [I]; C23C0002-06 [I]; C23C0002-28 [I]
CC 55-6 (Ferrous Metals and Alloys)
ST hot dip galvanized steel sheet ductility; stretch flangeability hot dip galvanized steel sheet; tensile strength hot dip galvanized steel sheet; galvannealed steel sheet automobile part; annealing cementite galvanized steel sheet; quenching bainite pearlite galvanized steel sheet; ferrite heat treatment galvanized steel sheet; galvanized steel sheet hot rolling
IT Heat treatment
(for thermal recrystn. of ferrite phases; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Galvanized steel
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hot-dip; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Annealing
Automobile parts
Cold rolling
Galvannealing
Hot rolling
Quenching (cooling)
(manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Recrystallization
(thermal, of ferrite phases; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT Rare earth metals
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(trace in alloys; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)

IT 51396-68-0DP, other metals
RL: IMP (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(galvannealed layer; manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)
IT 7440-70-2D, Calcium, trace in alloy 12169-32-3, Cementite 12427-23-5, Bainite 12427-24-6, Ferrite (ferrous metal component) 12427-27-9, Pearlite 12791-75-2 39308-06-0 1422274-76-7, processes 1422274-76-7D, Ca(0.001-0.005) REM (0.001-0.005), processes 1422274-77-8, processes 1422274-77-8D, Ca(0.001-0.005) REM (0.001-0.005), processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manuf. of hot-dip galvanized steel sheets having high ductility, stretch flangeability, and tensile strength)

L15 ANSWER 82 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2013:11896 CAPLUS Full-text
DOCUMENT NUMBER: 158:137246
TITLE: Heat-treated hardened steel with excellent impact performance, and method for manufacturing heat-treated hardened type component using the same
INVENTOR(S): Nam, Seung-Man; Im, Hee-Joong; Lee, Seung-Ha; Kim, Dong-Eun; Lee, Bo-Ryong; Kim, Young-Jin; Moon, Man-Been
PATENT ASSIGNEE(S): Hyundai Hysco, S. Korea
SOURCE: PCT Int. Appl., 21pp.; Chemical Indexing Equivalent to 156:209484 (KR)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Korean
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2013002441	A1	20130103	WO 2011-KR4785	20110630
KR 1108838	B1	20120131	KR 2011-64159	20110630
CN 103534372	A	20140122	CN 2011-80070743	20110630
CN 103534372	B	20160210		
EP 2728027	A1	20140507	EP 2011-868749	20110630
EP 2728027	B1	20190116		
US 20140083574	A1	20140327	US 2013-14115516	20131104
US 20160281190	A1	20160929	US 2016-15173200	20160603

PRIORITY APPLN. INFO.:

KR 2011-64159	A	20110630
WO 2011-KR4785	W	20110630
US 2013-14115516	A3	20131104

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2013002441	A1	Dead	20201202
KR 1108838	B1	Alive	20201121
CN 103534372	A	Alive	20201121
CN 103534372	B	Alive	20201120
EP 2728027	A1	Indeterminate	20201107
EP 2728027	B1	Indeterminate	20201107
US 20140083574	A1	Dead	20201120
US 20160281190	A1	Dead	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The title heat-treated hardened steel contains (by wt.%) C 0.12-0.8, Cr 0.01-2, Mo <0.2, B 0.0005-0.08, Sb <1.0, at least one of Ti and Nb <0.2, Si, Mn, Al and Ni satisfying one of content formulas i to iii (content formula i: Si 0.5-3, Mn 1-10 and Al 0.05-2; content formula ii: Si 0.5-3, Mn 1-10, Al <0.1 and Ni 0.01-8; content formula iii: Si 0.5-3, Mn 1-10, Al 0.1-2.5 and Ni 0.01-8), and Fe and other unavoidable impurities as balance. The heat-treated hardened steel has improved impact performance, tensile strength ≥1000 MPa, yield strength ≥800 MPa and elongation ≥10%. The heat-treated hardened steel has optionally a coating layer of Al-Si, Zn and oxidn.-resistant materials.
RETABLE

Referenced Author	Year	VOL	PG	Referenced Work	Referenced

```
        (RAU)          |(RPY)|(RVL)|(RPG) |      (RWK)          | File
=======================+=====+=====+======+=====================+===========
Hyundai Hysco          |2011 |     |      |KR 101033767 B1      |
Jfe Steel Kk           |2005 |     |      |JP 2005126817 A      |CAPLUS
Jfe Steel Kk           |2005 |     |      |JP 2005126817 A      |CAPLUS
Jfe Steel Kk           |2005 |     |      |JP 2005126818 A      |CAPLUS
Nippon Steel Corp      |2002 |     |      |JP 2002294397 A      |CAPLUS
IT   1356391-47-3   1356391-49-5   1356391-50-8
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (heat-treated hardened steel with excellent impact
        performance, and method for manufg. heat-treated hardened type
        component using the same)
RN   1356391-47-3  CAPLUS
CN   Iron alloy, base, Fe 80-98,Mn 1-10,Si 0.5-3,Al 0-2,Cr 0-2,Sb 0-1,C
     0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      80   -  98        7439-89-6
    Mn       1   -  10        7439-96-5
    Si       0.5 -   3        7440-21-3
    Al       0   -   2        7429-90-5
    Cr       0   -   2        7440-47-3
    Sb       0   -   1        7440-36-0
    C        0.1 -   0.8      7440-44-0
    Mo       0   -   0.2      7439-98-7
    Nb       0   -   0.2      7440-03-1
    Ti       0   -   0.2      7440-32-6
    B        0   -   0.1      7440-42-8

RN   1356391-49-5  CAPLUS
CN   Iron alloy, base, Fe 74-98,Mn 1-10,Ni 0-8,Si 0.5-3,Cr 0-2,Sb 0-1,C
     0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,Al 0-0.1,B 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      74   -  98        7439-89-6
    Mn       1   -  10        7439-96-5
    Ni       0   -   8        7440-02-0
    Si       0.5 -   3        7440-21-3
    Cr       0   -   2        7440-47-3
    Sb       0   -   1        7440-36-0
    C        0.1 -   0.8      7440-44-0
    Mo       0   -   0.2      7439-98-7
    Nb       0   -   0.2      7440-03-1
    Ti       0   -   0.2      7440-32-6
    Al       0   -   0.1      7429-90-5
    B        0   -   0.1      7440-42-8

RN   1356391-50-8  CAPLUS
CN   Iron alloy, base, Fe 72-98,Mn 1-10,Ni 0-8,Si 0.5-3,Al 0.1-2.5,Cr 0-2,Sb
     0-1,C 0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe      72   -  98        7439-89-6
    Mn       1   -  10        7439-96-5
    Ni       0   -   8        7440-02-0
    Si       0.5 -   3        7440-21-3
    Al       0.1 -   2.5      7429-90-5
    Cr       0   -   2        7440-47-3
    Sb       0   -   1        7440-36-0
    C        0.1 -   0.8      7440-44-0
    Mo       0   -   0.2      7439-98-7
    Nb       0   -   0.2      7440-03-1
    Ti       0   -   0.2      7440-32-6
    B        0   -   0.1      7440-42-8
```

IPCI C22C0038-00 [I]; C21D0009-46 [I]; C22C0038-58 [I]; C21D0008-00 [I];
C23C0002-04 [I]
IPCR C22C0038-00 [I]; C21D0008-00 [I]; C21D0009-46 [I]; C22C0038-58 [I];
C23C0002-04 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST thermally hardened steel impact resistance strength
IT Elongation, mechanical
Galvanizing
Heat treatment
Tensile strength
Yield strength
(heat-treated hardened steel with excellent impact performance, and method for manufg. heat-treated hardened type component using the same)
IT 1356391-47-3 1356391-49-5 1356391-50-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(heat-treated hardened steel with excellent impact performance, and method for manufg. heat-treated hardened type component using the same)
IT 7440-66-6, Zinc, uses 11099-22-2
RL: TEM (Technical or engineered material use); USES (Uses)
(heat-treated hardened steel with excellent impact performance, and method for manufg. heat-treated hardened type component using the same)

L15 ANSWER 83 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:1597558 CAPLUS Full-text
DOCUMENT NUMBER: 157:669168
TITLE: Toughness improvement through alternating current by submerged-arc welding of fine-grained structural steel S690 QL1 for offshore applications
AUTHOR(S): Henkel, K.-M.; Goldmann, F.; Hein, R.; Gericke, A.; Hinz, T.
CORPORATE SOURCE: Rostock, Germany
SOURCE: DVS-Berichte (2012), 286(DVS Congress 2012), 119-124
CODEN: DVSBA3; ISSN: 0418-9639
PUBLISHER: DVS Media GmbH
DOCUMENT TYPE: Journal
LANGUAGE: German
AB The high-strength fine-grained steel S690QL1 with sufficient mech. technol. values could be submerged-arc welded. The welds of thickness of 80 mm were subjected at -60° to hardness and notch impact bending tests. It was found that toughness values in the surface layer could be greatly improved and the requirements could be fulfilled for welded offshore applications. Tandem and tandem TwinArc processes enabled a significant increase of the welding speed up to 100 cm/min.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
de Payrebrune, J	2000	1		Aachener Berichte Fu	
Det Norske Veritas Germ	2009			Fabrication and Test	
Dilthey, U	1992			Unterpulverschwei.BETA.	
Dirksen, D	2006	240		DVS-Berichte	
Gosh, P	1998	38		ISIJ International	
Grobecker, J	1994			Dissertation, Aachen	
Killing, R	1982	34		Schwei.BETA.en und Schn	
Killing, R	1983	35		Schwei.BETA.en und Schn	CAPLUS
Muller, P	1983			Handbuch des Unterpu	
Muller, P	1983			Handbuch des Unterpu	
Stahlinstitut VDEh	1993			Stahl-Eisen-Werkstof	
Wanner, M	2011			12. Sondertagung Sch	

IT 12604-89-6, S690 QL1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(toughness improvement by a.c. by submerged-arc welding of fine-grained structural steel S690 QL1 for offshore applications)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST submerged arc welding steel offshore platform toughness improvement
IT Pipelines
(offshore; toughness improvement by a.c. by submerged-arc welding of fine-grained structural steel S690 QL1 for offshore applications)
IT Impact strength
Mechanical hardness
Offshore oil wells
Submerged-arc welds
Surface
Tensile strength
Toughness
(toughness improvement by a.c. by submerged-arc welding of fine-grained structural steel S690 QL1 for offshore applications)
IT 12604-89-6, S690 QL1, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(toughness improvement by a.c. by submerged-arc welding of fine-grained structural steel S690 QL1 for offshore applications)

L15 ANSWER 84 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:1353399 CAPLUS Full-text
DOCUMENT NUMBER: 158:337250
TITLE: Heat treatment effects on the reduction of hydrogen in multi-layer high-strength weld joints
AUTHOR(S): Mente, T.; Boellinghaus, Th.; Schmitz-Niederau, M.
CORPORATE SOURCE: Fr.
SOURCE: Welding in the World (2012), 56(7/8), 26-36
CODEN: WDWRAI; ISSN: 0043-2288
DIGITAL OBJECT ID: 10.1007/BF03321362
PUBLISHER: International Institute of Welding
DOCUMENT TYPE: Journal
LANGUAGE: English
AB High-strength structural steels with yield strengths up to 1 100 MPa are used in various industrial sectors such as for the construction of cranes, pipelines and offshore structures. However, with increasing strength the ductility and deformation capacities of these materials are reduced and thus, they show an enhanced sensitivity against degrdn. due to hydrogen with increasing yield strength. It means they become susceptible to hydrogen-assisted cold cracking (HACC) during fabrication welding. In order to avoid such defects, the existing stds. recommend preheating and/or interpass temp., as well as post heat treatments. However, the stds. relate only to steels with a max. yield strength of Rp0.2 = 960 MPa. Hence, in welding these high-strength structural steels with yield strengths up to 1 100 MPa, it is very important to have practical guidelines for detg. suitable heat treatment procedures to avoid HACC in welds, in particular in safety-relevant components. As a contribution to the further establishment of sufficient Hydrogen-Removal Heat Treatments (HRHT), two dimensional numerical models of butt and lap joints of various thicknesses were developed. Hydrogen diffusion and the effect of different post heat treatments upon hydrogen redn. in high-strength structural steel were studied. It turned out that the hydrogen diffusion behavior in the lap and the butt joints are quite different and that the hydrogen concn. in the lap joint can be reduced significantly faster in comparison to the butt joint.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				Welding - Recommenda	
Ansi				D1.1/D1.1M: 2004: St	
Astrom, H	2002			IIW Doc II-1460-02	
Aws					
Bhadeshia, H	2006		183	Steels - Microstruct	
Boellinghaus, T	1995	35	83	Doc IIW-1250, Weldin	CAPLUS
Boellinghaus, T	2003	7	651	Mathematical Modelli	
Boellinghaus, T	1995			PhD-Thesis, Helmut S	
Goldez, S	2009	16	2348	Engineering Failure	
Hutte, G	2002			Specification DH-E55	
Lindgren, L	2001	24	141	Journal of Thermal S	
Lindgren, L	2006	195	6710	Numerical modelling	
Macherauch, E	1983			Residual stresses:de	
Mehrer, H	2007	155	37	Springer Series in S	
Nevasmaa, P	2004	48	2	Doc IIW-1617	CAPLUS
Olden, V	2008	75	2333	Engineering Fracture	
Richter, F				Physikalische Eigens	
Ssab	2005			http://www.ssab.com/	
Wongpanya, P	2008	52	79	Doc IIW-1851, Weldin	CAPLUS
Wongpanya, P	2007	8	743	Mathematical Modelli	
Wongpanya, P	2008			PhD-Thesis, Helmut S	
Wongpanya, P	2006	50	96	Welding in the World	CAPLUS
Zimmer, P	2004			IIW Doc II-1525-04	

IT 186511-13-7, S690Q
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(heat treatment effects on redn. of hydrogen in multi-layer high-strength weld joints)
RN 186511-13-7 CAPLUS
CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8931) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	93	-	100	7439-89-6
Mn	0	-	1.70	7439-96-5
Ni	0	-	1.50	7440-02-0
Cr	0	-	1.00	7440-47-3
Si	0.15	-	0.80	7440-21-3
Mo	0	-	0.60	7439-98-7
Cu	0	-	0.50	7440-50-8
C	0	-	0.20	7440-44-0
V	0	-	0.12	7440-62-2
Nb	0	-	0.05	7440-03-1
P	0	-	0.025	7723-14-0
S	0	-	0.025	7704-34-9
B	0	-	0.005	7440-42-8

CC 55-5 (Ferrous Metals and Alloys)
IT Butt welds
Deformation (mechanical)
Diffusion
Ductility
Elongation at break
Heat treatment
Tensile strength
Yield strength
(heat treatment effects on redn. of hydrogen in multi-layer high-strength weld joints)
IT 62199-99-9, S355, processes 186511-13-7, S690Q 629615-32-3, S1100QL
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(heat treatment effects on redn. of hydrogen in multi-layer high-strength weld joints)
OS.CITING REF COUNT: 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD (4 CITINGS)

L15 ANSWER 85 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:926745 CAPLUS Full-text
DOCUMENT NUMBER: 157:110317
TITLE: Method for forming and hardening zinc coated steel sheets
INVENTOR(S): Sommer, Andreas; Kolnberger, Siegfried; Rabler, Gerald; Schwinghammer, Harald
PATENT ASSIGNEE(S): voestalpine Stahl GmbH, Austria
SOURCE: PCT Int. Appl., 20pp.; Chemical Indexing Equivalent to 157:110314 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 6
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012085248	A2	20120628	WO 2011-EP73882	20111222
WO 2012085248	A3	20120816		
DE 102010056265	B3	20120503	DE 2010-102010056265	20101224
DE 102010056264	A1	20120628	DE 2010-102010056264	20101224
DE 102010056264	B4	20121227		
DE 102010056264	C5	20200409		
DE 102011053939	A1	20130328	DE 2011-102011053939	20110926
DE 102011053939	B4	20151029		
DE 102011053941	A1	20130328	DE 2011-102011053941	20110926
DE 102011053941	B4	20151105		
EP 2655674	A2	20131030	EP 2011-808645	20111222
EP 2655674	B1	20210203		
CN 103415630	A	20131127	CN 2011-80068546	20111222
CN 103415630	B	20150923		
ES 2851176	T3	20210903	ES 2011-808645	20111222

PRIORITY APPLN. INFO.:

DE 2010-102010056264	A	20101224
DE 2010-102010056265	A	20101224
DE 2011-102011053939	A	20110926
DE 2011-102011053941	A	20110926
WO 2011-EP73882	W	20111222

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2012085248	A2	Dead	20201202
WO 2012085248	A3	Dead	20201202
DE 102010056265	B3	Alive	20201121
DE 102010056264	A1	Alive	20201121
DE 102010056264	B4	Alive	20201121
DE 102010056264	C5	Alive	20201121
DE 102011053939	A1	Dead	20201121
DE 102011053939	B4	Dead	20201121
DE 102011053941	A1	Dead	20201121
DE 102011053941	B4	Dead	20201120
EP 2655674	A2	Indeterminate	20210204
EP 2655674	B1	Indeterminate	20210204
CN 103415630	A	Alive	20201121
CN 103415630	B	Alive	20201121
ES 2851176	T3	Alive	20210916

AB The invention relates to a method for forming and hardening coated steel sheets. The steel used comprises, wt.%: C 0.08-0.6, Mn 0.8-3.0, Al 0.01-0.07, Si 0.01-0.5, Cr 0.02-0.6, Ti 0.01-0.05, N 0.003-0.1, B 0.005-0.06, P and S <0.01 each, and Mo <1. According to the method, a blank is stamped out from sheet metal that is coated with the zinc or zinc alloy, the stamped-out blank is heated to a temp. ≥Ac3 and optionally held at this temp. for a predetd. time to allow the formation of austenite, and the heated blank is then transferred to a forming tool, is formed in the forming tool and cooled in the forming tool at a rate above the crit. quenching rate, thereby being hardened. In order to keep zinc from adhering to the forming tool, the steel material is adjusted to delay conversion such that the steel material is quench-hardened by the conversion of austenite to martensite at a forming temp. in the range of 500° to 800°, particularly 500° to 600° and more particularly below the peritectic temp. of the zinc-iron phase

diagram.
IT 1381757-38-5
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
RN 1381757-38-5 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.8-3,Mo 0-1,C 0.1-0.6,Cr 0-0.6,Si 0-0.5,Al 0-0.1,B 0-0.1,N 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.8 - 3	7439-96-5
Mo	0 - 1	7439-98-7
C	0.1 - 0.6	7440-44-0
Cr	0 - 0.6	7440-47-3
Si	0 - 0.5	7440-21-3
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
N	0 - 0.1	17778-88-0

IPCI C21D0001-673 [I]; C21D0009-48 [I]; C23C0002-06 [I]; C23C0002-28 [I]
IPCR C21D0001-673 [I]; C21D0009-48 [I]; C23C0002-06 [I]; C23C0002-28 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST steel zinc coating stamping press molding heat treatment hardening
IT Anticorrosive coating materials
Coating process
Hardening (mechanical)
Heat treatment
Press molding
(method for forming and hardening zinc coated steel sheets)
IT Metalworking
(stamping; method for forming and hardening zinc coated steel sheets)
IT 1381757-38-5
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
IT 7440-66-6, Zinc, uses 1273147-93-5, Zinc alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(method for forming and hardening zinc coated steel sheets)

L15 ANSWER 86 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:925411 CAPLUS Full-text
DOCUMENT NUMBER: 157:110314
TITLE: Method for forming and hardening zinc coated steel sheets
INVENTOR(S): Kolnberger, Siegfried; Kurz, Thomas; Rosner, Martin; Schwinghammer, Harald
PATENT ASSIGNEE(S): Voestalpine Stahl GmbH, Austria
SOURCE: Ger. Offen., 13pp.; Chemical Indexing Equivalent to 157:110313 (WO), 157:110317 (WO)
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 6
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 102010056264	A1	20120628	DE 2010-102010056264	20101224
DE 102010056264	B4	20121227		
DE 102010056264	C5	20200409		
WO 2012085247	A2	20120628	WO 2011-EP73880	20111222
WO 2012085247	A3	20120816		
WO 2012085248	A2	20120628	WO 2011-EP73882	20111222
WO 2012085248	A3	20120816		

WO	2012085251	A2	20120628	WO 2011-EP73887	20111222
WO	2012085251	A3	20120816		
WO	2012085253	A2	20120628	WO 2011-EP73889	20111222
WO	2012085253	A3	20120816		
WO	2012085256	A3	20120816	WO 2011-EP73892	20111222
EP	2655672	A2	20131030	EP 2011-807691	20111222
EP	2655672	B1	20201216		
EP	2655673	A2	20131030	EP 2011-808211	20111222
EP	2655673	B1	20210203		
EP	2655674	A2	20131030	EP 2011-808645	20111222
EP	2655674	B1	20210203		
EP	2655675	A2	20131030	EP 2011-811025	20111222
EP	2655675	B1	20210310		
CN	103384726	A	20131106	CN 2011-80068494	20111222
CN	103384726	B	20161123		
CN	103392014	A	20131113	CN 2011-80068528	20111222
CN	103392014	B	20160127		
KR	2013126962	A	20131121	KR 2013-7019703	20111222
CN	103415630	A	20131127	CN 2011-80068546	20111222
CN	103415630	B	20150923		
KR	2013132565	A	20131204	KR 2013-7019700	20111222
KR	1582922	B1	20160107		
KR	2013132566	A	20131204	KR 2013-7019701	20111222
CN	103547686	A	20140129	CN 2011-80068492	20111222
CN	103547686	B	20161123		
CN	103547687	A	20140129	CN 2011-80068534	20111222
JP	2014505791	T	20140306	JP 2013-545421	20111222
JP	5727037	B2	20150603		
JP	2014507556	T	20140327	JP 2013-545422	20111222
ES	2848159	T3	20210805	ES 2011-807691	20111222
ES	2851176	T3	20210903	ES 2011-808645	20111222
ES	2853207	T3	20210915	ES 2011-808211	20111222
US	20140020795	A1	20140123	US 2013-13997585	20131010
US	20140027026	A1	20140130	US 2013-13997416	20131015
US	10640838	B2	20200505		

PRIORITY APPLN. INFO.:

DE	2010-102010056264	A	20101224
DE	2010-102010056265	A	20101224
DE	2011-102011053939	A	20110926
DE	2011-102011053941	A	20110926
WO	2011-EP73880	W	20111222
WO	2011-EP73882	W	20111222
WO	2011-EP73887	W	20111222
WO	2011-EP73889	W	20111222
WO	2011-EP73892	W	20111222

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
DE 102010056264	A1	Alive	20201121
DE 102010056264	B4	Alive	20201121
DE 102010056264	C5	Alive	20201121
WO 2012085247	A2	Dead	20201202
WO 2012085247	A3	Dead	20201201
WO 2012085248	A2	Dead	20201202
WO 2012085248	A3	Dead	20201202
WO 2012085251	A2	Dead	20201202
WO 2012085251	A3	Dead	20201202
WO 2012085253	A2	Dead	20201202
WO 2012085253	A3	Dead	20201202
WO 2012085256	A3	Dead	20201202
EP 2655672	A2	Indeterminate	20201217
EP 2655672	B1	Indeterminate	20201217
EP 2655673	A2	Indeterminate	20210204
EP 2655673	B1	Indeterminate	20210204
EP 2655674	A2	Indeterminate	20210204
EP 2655674	B1	Indeterminate	20210204
EP 2655675	A2	Indeterminate	20210311
EP 2655675	B1	Indeterminate	20210311
CN 103384726	A	Alive	20201121
CN 103384726	B	Alive	20201121
CN 103392014	A	Alive	20201121
CN 103392014	B	Alive	20201121
KR 2013126962	A	Dead	20201121

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     CN 103415630          A    Alive           20201121
     CN 103415630          B    Alive           20201121
     KR 2013132565         A    Alive           20201121
     KR 1582922            B1   Alive           20201121
     KR 2013132566         A    Dead            20201121
     CN 103547686          A    Alive           20201121
     CN 103547686          B    Alive           20201120
     CN 103547687          A    Dead            20201120
     JP 5727037            B2   Alive           20201121
     ES 2848159            T3   Alive           20210820
     ES 2851176            T3   Alive           20210916
     ES 2853207            T3   Alive           20210923
     US 20140020795        A1   Dead            20201121
     US 20140027026        A1   Alive           20201121
     US 10640838           B2   Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The invention relates to a method for forming and hardening coated
     steel sheets.  The steel used comprises, wt.%: C 0.08-0.6, Mn 0.8-3.0,
     Al 0.01-0.07, Si 0.01-0.5, Cr 0.02-0.6, Ti 0.01-0.05, N 0.003-0.1, B
     0.005-0.06, P and S <0.01 each, and Mo <1.  According to the method, a
     blank is stamped out from sheet metal that is coated with the zinc or
     zinc alloy, the stamped-out blank is heated to a temp. ≥Ac3 and
     optionally held at this temp. for a predetd. time to allow the formation
     of austenite, and the heated blank is then transferred to a forming tool,
     is formed in the forming tool and cooled in the forming tool at a rate
     above the crit. quenching rate, thereby being hardened.  In order to keep
     zinc from adhering to the forming tool, the steel material is adjusted
     to delay conversion such that the steel material is quench-hardened by
     the conversion of austenite to martensite at a forming temp. in the range
     of 600° to 800°, particularly 730° to 782° and
     more particularly below the peritectic temp. of the zinc-iron phase
     diagram.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
Anon                   |     |     |      |EP 1439240 B1       |CAPLUS
Anon                   |     |     |      |EP 1642991 B1       |CAPLUS
Anon                   |     |     |      |WO 2010069588 A1    |CAPLUS
Dosdat, L              |     |     |S1    |Corrosion resistance|
IT   1381757-38-5
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (method for forming and hardening zinc coated steel
        sheets)
RN   1381757-38-5  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.8-3,Mo 0-1,C 0.1-0.6,Cr 0-0.6,Si 0-0.5,Al
     0-0.1,B 0-0.1,N 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+================
    Fe      94   -  99        7439-89-6
    Mn       0.8 -   3        7439-96-5
    Mo       0   -   1        7439-98-7
    C        0.1 -   0.6      7440-44-0
    Cr       0   -   0.6      7440-47-3
    Si       0   -   0.5      7440-21-3
    Al       0   -   0.1      7429-90-5
    B        0   -   0.1      7440-42-8
    N        0   -   0.1     17778-88-0

IPCI C21D0008-04 [I]; C21D0001-68 [I]; C22C0038-04 [I]; C22C0038-38 [I];
     C21D0008-04 [I]; C21D0001-68 [I]; C22C0038-04 [I]; C22C0038-38 [I];
     C21D0008-04 [I]; C21D0001-68 [I]; C22C0038-04 [I]; C22C0038-38 [I]
IPCR C21D0008-04 [I]; C21D0001-68 [I]; C22C0038-04 [I]; C22C0038-38 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   steel zinc coating stamping press molding heat treatment hardening
IT   Anticorrosive coating materials
       Coating process
     Hardening (mechanical)
     Heat treatment
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Press molding
(method for forming and hardening zinc coated steel sheets)
IT Metalworking
(stamping; method for forming and hardening zinc coated steel sheets)
IT 1381757-38-5
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
IT 7440-66-6, Zinc, uses 1273147-93-5, Zinc alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
OS.CITING REF COUNT: 2 THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD (2 CITINGS)

L15 ANSWER 87 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:924079 CAPLUS Full-text
DOCUMENT NUMBER: 157:110313
TITLE: Method for forming and hardening zinc coated steel sheets
INVENTOR(S): Schwinghammer, Harald; Kurz, Thomas; Kolnberger, Siegfried; Rosner, Martin
PATENT ASSIGNEE(S): Voestalpine Stahl GmbH, Austria
SOURCE: PCT Int. Appl., 19pp.; Chemical Indexing Equivalent to 157:110314 (DE)
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 6
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012085251	A2	20120628	WO 2011-EP73887	20111222
WO 2012085251	A3	20120816		
DE 102010056265	B3	20120503	DE 2010-102010056265	20101224
DE 102010056264	A1	20120628	DE 2010-102010056264	20101224
DE 102010056264	B4	20121227		
DE 102010056264	C5	20200409		
DE 102011053939	A1	20130328	DE 2011-102011053939	20110926
DE 102011053939	B4	20151029		
DE 102011053941	A1	20130328	DE 2011-102011053941	20110926
DE 102011053941	B4	20151105		
EP 2655673	A2	20131030	EP 2011-808211	20111222
EP 2655673	B1	20210203		
CN 103547687	A	20140129	CN 2011-80068534	20111222
ES 2853207	T3	20210915	ES 2011-808211	20111222

PRIORITY APPLN. INFO.:
DE 2010-102010056264 A 20101224
DE 2010-102010056265 A 20101224
DE 2011-102011053939 A 20110926
DE 2011-102011053941 A 20110926
WO 2011-EP73887 W 20111222

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2012085251	A2	Dead	20201202
WO 2012085251	A3	Dead	20201202
DE 102010056265	B3	Alive	20201121
DE 102010056264	A1	Alive	20201121
DE 102010056264	B4	Alive	20201121
DE 102010056264	C5	Alive	20201121
DE 102011053939	A1	Dead	20201121
DE 102011053939	B4	Dead	20201121
DE 102011053941	A1	Dead	20201121
DE 102011053941	B4	Dead	20201120
EP 2655673	A2	Indeterminate	20210204
EP 2655673	B1	Indeterminate	20210204
CN 103547687	A	Dead	20201120
ES 2853207	T3	Alive	20210923

AB The invention relates to a method for producing a hardened structural steel element comprising a zinc or zinc alloy coating. The steel used comprises, wt.%: C 0.08-0.6, Mn 0.8-3.0, Al 0.01-0.07, Si 0.01-0.5, Cr 0.02-0.6, Ti 0.01-0.05, N 0.003-0.1, B 0.005-0.06, P and S <0.01 each, and Mo <1. According to the method, a blank is stamped out from sheet metal that is coated with the zinc or zinc alloy, the stamped-out blank is heated to a temp. ≥Ac3 and optionally held at this temp. for a predetd. time to allow the formation of austenite, and the heated blank is then transferred to a forming tool, is formed in the forming tool and cooled in the forming tool at a rate above the crit. quenching rate, thereby being hardened, and the steel material is adjusted to delay conversion such that the steel material is quench-hardened by the conversion of austenite to martensite at a forming temp. in the range of 600° to 800°, particularly 730° to 782° and more particularly below the peritectic temp. of the zinc-iron phase diagram.

IT 1381757-38-5
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for forming and hardening zinc coated steel sheets)

RN 1381757-38-5 CAPLUS

CN Iron alloy, base, Fe 94-99,Mn 0.8-3,Mo 0-1,C 0.1-0.6,Cr 0-0.6,Si 0-0.5,Al 0-0.1,B 0-0.1,N 0-0.1 (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	94	-	99	7439-89-6
Mn	0.8	-	3	7439-96-5
Mo	0	-	1	7439-98-7
C	0.1	-	0.6	7440-44-0
Cr	0	-	0.6	7440-47-3
Si	0	-	0.5	7440-21-3
Al	0	-	0.1	7429-90-5
B	0	-	0.1	7440-42-8
N	0	-	0.1	17778-88-0

IPCI C21D0001-673 [I]; C21D0009-48 [I]; C23C0002-06 [I]
IPCR C21D0001-673 [I]; C21D0009-48 [I]; C23C0002-06 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST steel zinc coating stamping press molding heat treatment hardening
IT Anticorrosive coating materials
Coating process
Hardening (mechanical)
Heat treatment
Press molding
(method for forming and hardening zinc coated steel sheets)
IT Metalworking
(stamping; method for forming and hardening zinc coated steel sheets)
IT 1381757-38-5
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
IT 7440-66-6, Zinc, uses 1273147-93-5, Zinc alloy
RL: TEM (Technical or engineered material use); USES (Uses)
(method for forming and hardening zinc coated steel sheets)
OS.CITING REF COUNT: 11 THERE ARE 11 CAPLUS RECORDS THAT CITE THIS RECORD (13 CITINGS)

L15 ANSWER 88 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:665719 CAPLUS Full-text
DOCUMENT NUMBER: 156:594034
TITLE: Method for manufacturing automobile part having different local strengths using heat-treatment hardening steel plate
INVENTOR(S): Nam, Seung-Man; Chae, Su-Hong; Kwon, Min-Suck; Kim,

Hyo-Sub; Im, Hee-Joong; Lee, Bo-Ryong; Moon, Man-Been
PATENT ASSIGNEE(S): Hyundai Hysco, S. Korea
SOURCE: PCT Int. Appl., 19pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Korean
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012060496	A1	20120510	WO 2010-KR7829	20101108
KR 1033767	B1	20110509	KR 2010-108528	20101103
CN 102712962	A	20121003	CN 2010-80038066	20101108
CN 102712962	B	20170524		
JP 2013501631	T	20130117	JP 2012-541934	20101108
JP 5509337	B2	20140604		
EP 2636759	A1	20130911	EP 2010-855727	20101108
EP 2636759	B1	20190605		
US 20120216920	A1	20120830	US 2012-13390537	20120215
US 20150167111	A1	20150618	US 2015-14630390	20150224

PRIORITY APPLN. INFO.:

KR 2010-108528	A	20101103
WO 2010-KR7829	W	20101108
US 2012-13390537	A3	20120215

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2012060496	A1	Dead	20201202
KR 1033767	B1	Alive	20201121
CN 102712962	A	Alive	20201121
CN 102712962	B	Alive	20201120
JP 5509337	B2	Alive	20201121
EP 2636759	A1	Indeterminate	20201106
EP 2636759	B1	Indeterminate	20201106
US 20120216920	A1	Dead	20201120
US 20150167111	A1	Dead	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB The present invention relates to a method for manufg. automobile parts having different local strengths, and more specifically, to a method for manufg. automobile parts using a heat-treatment hardened steel having different local thicknesses. The present invention provides a method for manufg. automobile parts comprising: a blank sheet prepn. step for prepg. blank sheets using a heat-treatment hardening steel plate having different thicknesses, and a heat-treatment hardening steel plate having different materials, according to the strength required; a blank conjugate forming step for forming a blank conjugate by connecting the blank sheets using laser welding; a cold molding step for cold press molding the blank conjugates; and a heat-treatment hardening step for heating the cold-molded part to above AC3 temp., then resolving mold retention stress by quenching the part when constrained in a metal mold, and enhancing the strength thereby.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Aisin Takaoka Ltd	2004			JP 2004058082 A	CAPLUS
Hyundai Hysco	2009			KR 100902857 B1	
Sumitomo Metal Ind Ltd	2007			JP 2007154257 A	CAPLUS
Voestalpine Automotive	2006			WO 2006015849 A2	CAPLUS

IT 1374118-68-9
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)
RN 1374118-68-9 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.2-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1,S 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5

Cr	0	-	1	7440-47-3
C	0.2	-	0.5	7440-44-0
Si	0.2	-	0.5	7440-21-3
Ti	0	-	0.2	7440-32-6
Al	0	-	0.1	7429-90-5
B	0	-	0.1	7440-42-8
P	0	-	0.1	7723-14-0
S	0	-	0.1	7704-34-9

IPCI C21D0008-02 [I]; C21D0001-00 [I]; B21D0022-00 [I]; B23K0026-20 [I]
IPCR C21D0008-02 [I]; B21D0022-00 [I]; B23K0026-20 [I]; C21D0001-00 [I]
CC 55-5 (Ferrous Metals and Alloys)
ST steel heat treatment welding molding hardening zinc coating automobile
IT Automobile parts
Coating materials
Cold-press molding
Hardening (mechanical)
Heat treatment
Laser welding
Quenching (cooling)
Residual stress
(method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)
IT 7429-90-5, Aluminum, processes 7440-66-6, Zinc, processes 11133-86-1
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)
IT 7439-98-7, Molybdenum, uses 7440-02-0, Nickel, uses 7440-03-1, Niobium, uses 7440-36-0, Antimony, uses 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses
RL: MOA (Modifier or additive use); USES (Uses)
(method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)
IT 1297459-46-1, processes 1297459-50-7, processes 1374118-68-9 1374118-70-3, processes 1374118-73-6
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. automobile part having different local strengths using heat-treatment hardening steel plate)

L15 ANSWER 89 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:543816 CAPLUS Full-text
DOCUMENT NUMBER: 157:526061
TITLE: Arc spraying of nanostructured wires on steel surfaces: influence of coating thickness on microstructure and fracture toughness
AUTHOR(S): Askandarani, A.; Hashmi, M. S. J.; Yilbas, B. S.
CORPORATE SOURCE: School of Mechanical and Manufacturing Eng., DCU, Dublin, Ire.
SOURCE: Advanced Materials Research (Durnten-Zurich, Switzerland) (2012), 445(Materials and Manufacturing Technologies XIV), 803-808
CODEN: AMREFI; ISSN: 1022-6680
DIGITAL OBJECT ID: 10.4028/www.scientific.net/AMR.445.803
PUBLISHER: Trans Tech Publications Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Nano-structured coating materials become demanding, since it improves the mech. properties, such as hardness, through grain refinement. One of the methods of producing nano-structured coatings is to use an arc spray coating process using nano-structured wires. Although the arc spraying process is well developed, the influence of nanoparticles on the fracture toughness of the coating surface has not been examd. in details. Consequently, in the present study, arc spraying of nano-structured wires on carbon steel surface is carried out. The influence of coating thickness on the microstructure and fracture toughness of the coating is investigated. It is found that the self annealing due to large coating thicknesses has a noticeable effect on the microstructure and fracture toughness.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Abdolmaleki, A	2003	19	1033	Materials Science an	CAPLUS
Anon				www. praxair. com/ p	
Branagan, D	2003	14	196	Journal of Thermal S	
Cantera, E	1998	37	201	Materials Letters	CAPLUS
Dupas-Bruzek, C	2003	93	4489	Journal of Applied P	CAPLUS
Evans, A	1976	24	939	Acta Metallurgica	CAPLUS
Gedzevicius, I	2006	175	206	Journal of Materials	CAPLUS
Jeon, H	2007	353-3	1785	Key Engineering Mate	
Kalligerakis, K	1995	7	16	International Journa	
Klimpel, A	2008	30	121	Archives of Materoa;	
Lopez Cantera, E	1998	37	201	Materials Letters	
Nakao, Y	1992	10	113	Yosetsu Gakkai Ronbu	CAPLUS
Niihara, K	1983	5	97	Fracture Mechanics o	
Oh, S	2006	110	271	Solid State Phenomen	CAPLUS
Oliver, W	1992	7	1564	J of Materials Resea	CAPLUS
Sergejev, S	2006	12	388	Proc Estonian Acad S	

IT 916826-46-5, 140 MXC
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(influence of coating thickness on microstructure and fracture toughness in arc spraying of nanostructured wires on steel surfaces)
RN 916826-46-5 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 40	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 9	7440-03-1
W	0 - 9	7440-33-7
B	0 - 5	7440-42-8
Mn	0 - 5	7439-96-5
C	0 - 4	7440-44-0
Si	0 - 2	7440-21-3

CC 55-6 (Ferrous Metals and Alloys)
ST nanostructure wire steel coating microstructure fracture toughness arc spraying
IT Thermal spray coating process
(arc spraying; influence of coating thickness on microstructure and fracture toughness in arc spraying of nanostructured wires on steel surfaces)
IT Annealing
Cables and Wires
Cooling
Fracture toughness
Grain refinement
Microcrack
Microstructure
Nanostructures
Surface roughness
Thickness effect
Vickers hardness
Wear resistance
Young's modulus
(influence of coating thickness on microstructure and fracture toughness in arc spraying of nanostructured wires on steel surfaces)
IT 11121-90-7, Carbon steel, miscellaneous
RL: MSC (Miscellaneous)
(influence of coating thickness on microstructure and fracture toughness in arc spraying of nanostructured wires on steel surfaces)
IT 916826-46-5, 140 MXC
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);

PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(influence of coating thickness on microstructure and fracture toughness in arc spraying of nanostructured wires on steel surfaces)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 90 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:340397 CAPLUS Full-text
DOCUMENT NUMBER: 156:316277
TITLE: Method for manufacture coated steel parts by hot forming
INVENTOR(S): Verloop, Willem Cornelis; Genderen, Marc Jacco Van; Tol, Ronald Theodoor Van; Hensen, Guido Cornelis; Loiseaux, Jenny
PATENT ASSIGNEE(S): Tata Steel IJmuiden BV, Neth.
SOURCE: PCT Int. Appl., 15 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012028224	A1	20120308	WO 2011-EP3601	20110719
CA 2809187	A1	20120308	CA 2011-2809187	20110719
CN 103108964	A	20130515	CN 2011-80041783	20110719
CN 103108964	B	20150617		
EP 2611945	A1	20130710	EP 2011-734020	20110719
EP 2611945	B1	20180228		
KR 2013099042	A	20130905	KR 2013-7006164	20110719
JP 2013542315	T	20131121	JP 2013-525155	20110719
BR 112013004952	A2	20160816	BR 2013-112013004952	20110719
ES 2663005	T3	20180410	ES 2011-734020	20110719
US 9127329	B2	20150908	US 2013-13818041	20130220
US 20130153094	A1	20130620		
MX 2013002063	A	20130405	MX 2013-2063	20130221
IN 2013CN02333	A	20160603	IN 2013-CN2333	20130325
IN 360159	B	20210303		

PRIORITY APPLN. INFO.: EP 2010-9041 A 20100831
WO 2011-EP3601 W 20110719

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2012028224	A1	Dead	20201201
CA 2809187	A1	Dead	20201120
CN 103108964	A	Alive	20201121
CN 103108964	B	Alive	20201121
EP 2611945	A1	Indeterminate	20201106
EP 2611945	B1	Indeterminate	20201107
KR 2013099042	A	Alive	20201121
BR 112013004952	A2	Alive	20210617
ES 2663005	T3	Alive	20201120
US 9127329	B2	Alive	20201121
US 20130153094	A1	Alive	20201121
MX 2013002063	A	Dead	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The invention relates to a method for manufg. a coated part having high mech. properties using hot forming techniques. The method comprises the following steps: providing an annealed steel strip or blank or pre-shaped part that was coated with a metal or alloy before the annealing; cutting a blank from the strip before or after the annealing; optionally forming a pre-shaped part from the blank; heating the blank or pre-shaped part to a temp. of 500° at an av. heating rate of 16°/s or more; further heating the blank or pre-shaped part to a temp. between 700 and 1000°; hot forming the blank or pre-shaped part into a hot formed part; hardening the hot formed part. The steel has the following compn., wt.%: C 0.1-0.5, Mn 0.5-3.0, Si 0.1-0.5, Cr <1.0, Ti <0.2, Al <0.1, P <0.1, S <0.05, B 0.0005-0.08, optionally Nb and V <0.1 each, and Fe - the balance. The coating is a zinc alloy

comprising Al and Mg 1.0-5.0 wt.% each. The invention also relates to a method for manufg. a coated steel strip, blank or pre-shaped part, and to a coated steel strip, blank, or part and a hot formed part.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Cornelis, V	2010			WO 2010069588 A1	CAPLUS
Kazuh, K	2010			WO 2010005121 A1	CAPLUS
Thyssenkrupp Steel Ag	2009			DE 102008022400 A1	CAPLUS
Voestalpine Stahl Gmbh	2010			EP 2177641 A1	CAPLUS
Volks	2010			WO 2010085983 A1	CAPLUS

IT 1360605-36-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manuf. coated steel parts by hot forming)
RN 1360605-36-2 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.1-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Nb 0-0.1,P 0-0.1,V 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.1 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Nb	0 - 0.1	7440-03-1
P	0 - 0.1	7723-14-0
V	0 - 0.1	7440-62-2

IPCI C21D0008-04 [I]; C21D0009-46 [I]; C22C0038-02 [I]; C22C0038-04 [I]; C21D0001-673 [I]; C21D0009-48 [I]
IPCR C21D0008-04 [I]; C21D0001-673 [I]; C21D0009-46 [I]; C21D0009-48 [I]; C22C0038-02 [I]; C22C0038-04 [I]
CC 55-3 (Ferrous Metals and Alloys)
ST steel strip coating hot deformation
IT Plastic deformation
(hot; method for manuf. coated steel parts by hot forming)
IT 1360605-37-3
RL: TEM (Technical or engineered material use); USES (Uses)
(coating; method for manuf. coated steel parts by hot forming)
IT 1360605-36-2
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manuf. coated steel parts by hot forming)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 91 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:296418 CAPLUS Full-text
DOCUMENT NUMBER: 156:290294
TITLE: Steel sheet for hot pressing, its manufacturing method, and hot-pressed material
INVENTOR(S): Nakajima, Seiji; Nakamaru, Hiroki
PATENT ASSIGNEE(S): JFE Steel Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:
PATENT NO. KIND DATE APPLICATION NO. DATE

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     JP 2012041610        A    20120301    JP 2010-184840         20100820
     JP 5672849           B2   20150218
PRIORITY APPLN. INFO.:                     JP 2010-184840         20100820
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  -------------   -----------
     JP 2012041610        A    Alive           20201121
     JP 5672849           B2   Alive           20201120
AB   The steel sheet for hot pressing has an Al-Fe alloy coating layer
     contg. Fe 25-90%, Si 25-90%, and the balance of Al and inevitable
     impurities at an amt. of 10-200 g/m2 per one side of the steel sheet,
     and it is obtained from a steel sheet contg. C 0.15-0.5, Si 0.05-2.0, Mn
     0.5-3, P ≤0.1, S ≤0.05, Al ≤0.1 and N ≤0.01%
     by hot-dipping in an Al system bath to form the Al-Fe alloy layer and
     then hot-dip coated with an Al layer.  The steel sheet is heated to
     Ac3 to 1000°C and hot pressed.
IT   1356847-15-8
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (steel sheet for hot pressing, its manufg. method, and
        hot-pressed material)
RN   1356847-15-8  CAPLUS
CN   Iron alloy, base, Fe 93-99,Mn 0.5-3,Si 0-2,Cr 0-1,C 0.2-0.5,Ti 0-0.2,Al
     0-0.1,B 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+=============+===============
    Fe      93   -  99        7439-89-6
    Mn       0.5 -   3        7439-96-5
    Si       0   -   2        7440-21-3
    Cr       0   -   1        7440-47-3
    C        0.2 -   0.5      7440-44-0
    Ti       0   -   0.2      7440-32-6
    Al       0   -   0.1      7429-90-5
    B        0   -   0.1      7440-42-8
    P        0   -   0.1      7723-14-0

IPCI C23C0002-12 [I]; C22C0038-60 [I]; C22C0038-00 [I]; C22C0021-00 [I];
     C23C0002-20 [I]; C23C0002-28 [I]; C23C0002-12 [I]; C22C0038-60 [I];
     C22C0038-00 [I]; C22C0021-00 [I]; C23C0002-20 [I]; C23C0002-28 [I]
IPCR C23C0002-12 [I]; C22C0021-00 [I]; C22C0038-00 [I]; C22C0038-60 [I];
     C23C0002-20 [I]; C23C0002-28 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   steel sheet aluminum iron alloy coating hot pressing
IT   Hot-dip coating process
     Hot-press sintering
        (steel sheet for hot pressing, its manufg. method, and
        hot-pressed material)
IT   1359940-94-5   1359940-95-6
     RL: TEM (Technical or engineered material use); USES (Uses)
        (coating; steel sheet for hot pressing, its manufg.
        method, and hot-pressed material)
IT   1299468-35-1   1356847-15-8
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (steel sheet for hot pressing, its manufg. method, and
        hot-pressed material)
IT   7429-90-5, Aluminum, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (steel sheet for hot pressing, its manufg. method, and
        hot-pressed material)
OS.CITING REF COUNT:     3     THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD
                               (3 CITINGS)


L15  ANSWER 92 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2012:274720  CAPLUS Full-text
DOCUMENT NUMBER:         156:290355
TITLE:                   Method for manufacturing steel product with
                         different strength using laser heat treatment
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INVENTOR(S): Lim, Hui Jung; Nam, Seung Man; Lee, Bo Ryong; Kim, Gyeong Bo; Jung, Yeon Il
PATENT ASSIGNEE(S): Hyundai Hysco Co., Ltd., S. Korea
SOURCE: Repub. Korea, 10pp.
CODEN: KRXXFC
DOCUMENT TYPE: Patent
LANGUAGE: Korean
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
KR 1119173	B1	20120222	KR 2011-100174	20110930
WO 2013047939	A1	20130404	WO 2011-KR7703	20111017
CN 103842527	A	20140604	CN 2011-80073901	20111017
EP 2762577	A1	20140806	EP 2011-873399	20111017
EP 2762577	B1	20160427		
JP 2014534334	T	20141218	JP 2014-533173	20111017
JP 5898772	B2	20160406		
US 20140227553	A1	20140814	US 2014-14343955	20140310
US 20150211086	A1	20150730	US 2015-14683933	20150410

PRIORITY APPLN. INFO.:

KR 2011-100174	A	20110930
WO 2011-KR7703	W	20111017
US 2014-14343955	A3	20140310

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
KR 1119173	B1	Alive	20201121
WO 2013047939	A1	Dead	20201202
CN 103842527	A	Dead	20201121
EP 2762577	A1	Indeterminate	20201107
EP 2762577	B1	Indeterminate	20201106
JP 5898772	B2	Alive	20201121
US 20140227553	A1	Dead	20201121
US 20150211086	A1	Dead	20201121

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The title method comprises: (1) prepg. material composed of, by wt.%,: C 0.1-0.5, Si 0.1-0.5, Mn 0.5-3.0, P <0.1, S <0.05, Cr 0.01-1.0, Al <0.1, Ti <0.2, B 0.0005-0.08, and Fe and unavoidable impurities as balance, (2) forming the material into a preset shape to obtain a formed body, and (3) performing laser heat treatment for the part needing high strength on the formed body to locally strengthen the high-strength part. In the method, it is possible to perform local strengthening using laser heat treatment.

IT 1358890-23-9
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. steel product with different strength using laser heat treatment)

RN 1358890-23-9 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.1-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.1 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

IPCI C21D0001-09 [I]; C22C0038-38 [I]; C23C0002-04 [I]
IPCR C21D0001-09 [I]; C22C0038-38 [I]; C23C0002-04 [I]
CC 55-12 (Ferrous Metals and Alloys)
ST steel molding laser heat treatment mech property
IT Heat treatment
(laser; method for manufg. steel product with different strength using laser heat treatment)
IT Lasers

Mechanical properties
Molding
(method for manufg. steel product with different strength using laser heat treatment)

IT 7429-90-5, Aluminum, processes 7440-66-6, Zinc, processes 11133-86-1 12635-57-3
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating; method for manufg. steel product with different strength using laser heat treatment)

IT 1358690-23-9
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. steel product with different strength using laser heat treatment)

L15 ANSWER 93 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2012:198116 CAPLUS Full-text
DOCUMENT NUMBER: 156:236353
TITLE: Steel sheet for hot stamping, and process for manufacturing hot-stamped steel products using steel sheet for hot stamping
INVENTOR(S): Nakajima, Seiji; Miyoshi, Tatsuya; Nakamaru, Hiroki
PATENT ASSIGNEE(S): JFE Steel Corporation, Japan
SOURCE: PCT Int. Appl., 23pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2012018014	A1	20120209	WO 2011-JP67680	20110802
JP 4883240	B1	20120222	JP 2011-157378	20110719
JP 2012233247	A	20121129		
CA 2806263	A1	20120209	CA 2011-2806263	20110802
CA 2806263	C	20140325		
AU 2011286715	A1	20130214	AU 2011-286715	20110802
AU 2011286715	B2	20131205		
CN 103038398	A	20130410	CN 2011-80037013	20110802
CN 103038398	B	20141203		
KR 2013045898	A	20130506	KR 2013-7001759	20110802
KR 1361605	B1	20140211		
EP 2602359	A1	20130612	EP 2011-814639	20110802
EP 2602359	B1	20181010		
ZA 2013000566	A	20140326	ZA 2013-566	20110802
RU 2520847	C1	20140627	RU 2013-104193	20110802
MY 154711	A	20150715	MY 2013-333	20110802
BR 112013002586	A2	20160607	BR 2013-112013002586	20110802
BR 112013002586	B1	20201027		
TW I451004	B	20140901	TW 2011-127564	20110803
US 20130122322	A1	20130516	US 2013-13813328	20130130
US 9023488	B2	20150505		
IN 2013KN00256	A	20130705	IN 2013-KN256	20130130
IN 292658	B	20180209		
MX 2013001343	A	20130322	MX 2013-1343	20130201

PRIORITY APPLN. INFO.:

JP 2010-174957	A	20100804
JP 2011-553	A	20110105
JP 2011-91633	A	20110418
JP 2011-157378	A	20110719
WO 2011-JP67680	W	20110802

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2012018014	A1	Dead	20201202
JP 4883240	B1	Alive	20201120
JP 2012233247	A	Alive	20201121
CA 2806263	A1	Alive	20201120
CA 2806263	C	Alive	20201121
AU 2011286715	A1	Alive	20201121
AU 2011286715	B2	Alive	20201121

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     CN 103038398          A    Alive           20201120
     CN 103038398          B    Alive           20201120
     KR 2013045898         A    Alive           20201121
     KR 1361605            B1   Alive           20201121
     EP 2602359            A1   Indeterminate   20201107
     EP 2602359            B1   Indeterminate   20201107
     RU 2520847            C1   Alive           20201121
     MY 154711             A    Alive           20201202
     BR 112013002586       A2   Alive           20201120
     BR 112013002586       B1   Alive           20201121
     TW I451004            B    Alive           20201121
     US 20130122322        A1   Alive           20201121
     US 9023488            B2   Alive           20201121
     MX 2013001343         A    Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The purpose of the present invention is to provide a steel sheet which
     is to be hot-stamped and which can yield hot-stamped products with
     excellent pitting corrosion resistance and a process for manufg.
     hot-stamped steel products using the steel sheet.  A steel sheet for
     hot stamping, characterized by bearing, successively on the surface of a
     substrate steel sheet, a plating layer (I) which contains at least 60%
     by mass of Ni, with the balance consisting of Zn and unavoidable
     impurities, and which has a plating wt. of 0.01 to 5 g/m2, and a plating
     layer (II) which contains 10 to 25% by mass of Ni, with the balance
     consisting of Zn and unavoidable impurities, and which has a plating wt.
     of 10 to 90 g/m2.
RETABLE
```

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Kobe Steel Ltd	1995			JP 07166371 A	CAPLUS
Sumitomo Metal Industri	1999			JP 11-350198 A	CAPLUS
Sumitomo Metal Industri	2003			CN 101144162 A	CAPLUS
Sumitomo Metal Industri	2003			EP 1439240 A1	CAPLUS
Sumitomo Metal Industri	2003			CN 1575348 A	CAPLUS
Sumitomo Metal Industri	2003			WO 2003035922 A1	
Sumitomo Metal Industri	2003			JP 2003129209 A	CAPLUS
Sumitomo Metal Industri	2003			JP 200373774 A	
Sumitomo Metal Industri	2003			US 20040166360 A1	CAPLUS
Sumitomo Metal Industri	2003			US 20050252262 A1	
Sumitomo Metal Industri	2003			KR 20060090309 A	
Sumitomo Metal Industri	2003			AT 468416 T	CAPLUS
Sumitomo Metal Industri	2003			DE 60236447 D	
United Technologies Cor	2004			SG 134989 A	CAPLUS
United Technologies Cor	2004			EP 1405934 A2	CAPLUS
United Technologies Cor	2004			CN 1497065 A	CAPLUS
United Technologies Cor	2004			KR 20040026618 A	
United Technologies Cor	2004			US 20040058189 A1	CAPLUS
United Technologies Cor	2004			JP 2004115914 A	CAPLUS
United Technologies Cor	2004			US 20050058848 A1	CAPLUS
United Technologies Cor	2004			CA 2441718 A	CAPLUS
United Technologies Cor	2004			CA 2441718 A1	CAPLUS
United Technologies Cor	2004			TW 276707 B	
United Technologies Cor	2004			BR 304193 A	
United Technologies Cor	2004			AT 397683 T	CAPLUS
United Technologies Cor	2004			DE 60321435 D	

```
IT   1356847-15-8
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (steel sheet for hot stamping, and process for manufg.
        hot-stamped steel products using steel sheet for
        hot stamping)
RN   1356847-15-8  CAPLUS
CN   Iron alloy, base, Fe 93-99,Mn 0.5-3,Si 0-2,Cr 0-1,C 0.2-0.5,Ti 0-0.2,Al
     0-0.1,B 0-0.1,P 0-0.1  (CA INDEX NAME)
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Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Si	0 - 2	7440-21-3

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    Cr      0   -   1       7440-47-3
    C       0.2 -   0.5     7440-44-0
    Ti      0   -   0.2     7440-32-6
    Al      0   -   0.1     7429-90-5
    B       0   -   0.1     7440-42-8
    P       0   -   0.1     7723-14-0

IPCI C25D0005-26 [I]; B21D0022-20 [I]; C22C0018-00 [I]; C22C0019-03 [I];
     C22C0038-00 [I]; C22C0038-60 [I]
IPCR C25D0005-26 [I]; B21D0022-20 [I]; C22C0018-00 [I]; C22C0019-03 [I];
     C22C0038-00 [I]; C22C0038-60 [I]
CC   55-6 (Ferrous Metals and Alloys)
     Section cross-reference(s): 72
ST   hot stamping steel sheet nickel zinc alloy electrodeposition
IT   Metalworking
        (stamping; steel sheet for hot stamping, and process for
        manufg. hot-stamped steel products using steel
        sheet for hot stamping)
IT   Electrodeposition
     Pitting corrosion
        (steel sheet for hot stamping, and process for manufg.
        hot-stamped steel products using steel sheet for
        hot stamping)
IT   Polysiloxanes
     RL: TEM (Technical or engineered material use); USES (Uses)
        (steel sheet for hot stamping, and process for manufg.
        hot-stamped steel products using steel sheet for
        hot stamping)
IT   7440-02-0, Nickel, uses   238084-01-0
     RL: TEM (Technical or engineered material use); USES (Uses)
        (coating; steel sheet for hot stamping, and process
        for manufg. hot-stamped steel products using steel
        sheet for hot stamping)
IT   7631-86-9, Colloidal silica, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (colloidal; steel sheet for hot stamping, and process for
        manufg. hot-stamped steel products using steel
        sheet for hot stamping)
IT   1299468-35-1   1356847-15-8
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (steel sheet for hot stamping, and process for manufg.
        hot-stamped steel products using steel sheet for
        hot stamping)
IT   3227-63-2, Zirconium acetate   11138-49-1, Sodium aluminate   12627-14-4,
     Lithium silicate   39302-37-9, Lithium titanate
     RL: TEM (Technical or engineered material use); USES (Uses)
        (steel sheet for hot stamping, and process for manufg.
        hot-stamped steel products using steel sheet for
        hot stamping)
OS.CITING REF COUNT:     5     THERE ARE 5 CAPLUS RECORDS THAT CITE THIS RECORD
                               (5 CITINGS)


L15  ANSWER 94 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2012:169521  CAPLUS Full-text
DOCUMENT NUMBER:         156:209484
TITLE:                   Heat-treated hardened steel with excellent impact
                         performance, and method for manufacturing heat-treated
                         hardened type component using the same
INVENTOR(S):             Nam, Seung Man; Lim, Hui Jung; Lee, Seung Ha; Kim,
                         Dong Eun; Lee, Bo Ryong; Kim, Yeong Jin; Moon, Man Bin
PATENT ASSIGNEE(S):      Hyundai Hysco Co., Ltd., S. Korea
SOURCE:                  Repub. Korea, 14pp.; Chemical Indexing Equivalent to
                         158:137246 (WO)
                         CODEN: KRXXFC
DOCUMENT TYPE:           Patent
LANGUAGE:                Korean
FAMILY ACC. NUM. COUNT:  2
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
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KR 1108838	B1	20120131	KR 2011-64159		20110630
WO 2013002441	A1	20130103	WO 2011-KR4785		20110630
CN 103534372	A	20140122	CN 2011-80070743		20110630
CN 103534372	B	20160210			
EP 2728027	A1	20140507	EP 2011-868749		20110630
EP 2728027	B1	20190116			
US 20140083574	A1	20140327	US 2013-14115516		20131104
US 20160281190	A1	20160929	US 2016-15173200		20160603

PRIORITY APPLN. INFO.:

KR 2011-64159	A	20110630
WO 2011-KR4785	W	20110630
US 2013-14115516	A3	20131104

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
KR 1108838	B1	Alive	20201121
WO 2013002441	A1	Dead	20201202
CN 103534372	A	Alive	20201121
CN 103534372	B	Alive	20201120
EP 2728027	A1	Indeterminate	20201107
EP 2728027	B1	Indeterminate	20201107
US 20140083574	A1	Dead	20201120
US 20160281190	A1	Dead	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB The title heat-treated hardened steel contains (by wt.%) C 0.12-0.8, Cr 0.01-2, Mo <0.2, B 0.0005-0.08, Sb <1.0, at least one of Ti and Nb <0.2, Si, Mn, Al and Ni satisfying one of content formulas i to iii (content formula i: Si 0.5-3, Mn 1-10 and Al 0.05-2; content formula ii: Si 0.5-3, Mn 1-10, Al <0.1 and Ni 0.01-8; content formula iii: Si 0.5-3, Mn 1-10, Al 0.1-2.5 and Ni 0.01-8), and Fe and other unavoidable impurities as balance. The heat-treated hardened steel has improved impact performance, tensile strength ≥1000 MPa, yield strength ≥800 MPa and elongation ≥10%. The heat-treated hardened steel has optionally a coating layer of Al-Si, Zn and oxidn.-resistant materials.

IT 1356391-47-3 1356391-49-5 1356391-50-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(heat-treated hardened steel with excellent impact performance, and method for manufg. heat-treated hardened type component using the same)

RN 1356391-47-3 CAPLUS
CN Iron alloy, base, Fe 80-98,Mn 1-10,Si 0.5-3,Al 0-2,Cr 0-2,Sb 0-1,C 0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	80 - 98	7439-89-6
Mn	1 - 10	7439-96-5
Si	0.5 - 3	7440-21-3
Al	0 - 2	7429-90-5
Cr	0 - 2	7440-47-3
Sb	0 - 1	7440-36-0
C	0.1 - 0.8	7440-44-0
Mo	0 - 0.2	7439-98-7
Nb	0 - 0.2	7440-03-1
Ti	0 - 0.2	7440-32-6
B	0 - 0.1	7440-42-8

RN 1356391-49-5 CAPLUS
CN Iron alloy, base, Fe 74-98,Mn 1-10,Ni 0-8,Si 0.5-3,Cr 0-2,Sb 0-1,C 0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,Al 0-0.1,B 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	74 - 98	7439-89-6
Mn	1 - 10	7439-96-5
Ni	0 - 8	7440-02-0
Si	0.5 - 3	7440-21-3
Cr	0 - 2	7440-47-3
Sb	0 - 1	7440-36-0
C	0.1 - 0.8	7440-44-0

```
    Mo        0   -   0.2       7439-98-7
    Nb        0   -   0.2       7440-03-1
    Ti        0   -   0.2       7440-32-6
    Al        0   -   0.1       7429-90-5
    B         0   -   0.1       7440-42-8

RN   1356391-50-8  CAPLUS
CN   Iron alloy, base, Fe 72-98,Mn 1-10,Ni 0-8,Si 0.5-3,Al 0.1-2.5,Cr 0-2,Sb
     0-1,C 0.1-0.8,Mo 0-0.2,Nb 0-0.2,Ti 0-0.2,B 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+=============+===============
    Fe      72   -  98        7439-89-6
    Mn       1   -  10        7439-96-5
    Ni       0   -   8        7440-02-0
    Si       0.5 -   3        7440-21-3
    Al       0.1 -   2.5      7429-90-5
    Cr       0   -   2        7440-47-3
    Sb       0   -   1        7440-36-0
    C        0.1 -   0.8      7440-44-0
    Mo       0   -   0.2      7439-98-7
    Nb       0   -   0.2      7440-03-1
    Ti       0   -   0.2      7440-32-6
    B        0   -   0.1      7440-42-8

IPCI C22C0038-00 [I]; C21D0009-46 [I]; C21D0008-00 [I]; C23C0002-04 [I]
IPCR C22C0038-00 [I]; C21D0008-00 [I]; C21D0009-46 [I]; C23C0002-04 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   thermally hardened steel impact resistance strength
IT   Elongation, mechanical
     Galvanizing
     Heat treatment
     Tensile strength
     Yield strength
        (heat-treated hardened steel with excellent impact
        performance, and method for manufg. heat-treated hardened type
        component using the same)
IT   1356391-47-3   1356391-49-5   1356391-50-8
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (heat-treated hardened steel with excellent impact
        performance, and method for manufg. heat-treated hardened type
        component using the same)
IT   7440-66-6, Zinc, uses   11099-22-2
     RL: TEM (Technical or engineered material use); USES (Uses)
        (heat-treated hardened steel with excellent impact
        performance, and method for manufg. heat-treated hardened type
        component using the same)


L15  ANSWER 95 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2011:1180009  CAPLUS Full-text
DOCUMENT NUMBER:         156:38921
TITLE:                   Optimal Weld Parameters, Weld Microstructure,
                         Mechanical Properties, and Hydrogen Absorption: An
                         Effective Analysis
AUTHOR(S):               Bhattacharya, J.; Pal, T. K.
CORPORATE SOURCE:        Metallurgical and Materials Engineering Department,
                         Jadavpur University, Kolkata, India
SOURCE:                  Journal of Materials Engineering and Performance
                         (2011), 20(7), 1336-1345
                         CODEN: JMEPEG; ISSN: 1059-9495
DIGITAL OBJECT ID:       10.1007/s11665-010-9771-5
PUBLISHER:               Springer
DOCUMENT TYPE:           Journal; (online computer file)
LANGUAGE:                English
AB   Weld bead-in-grooves were deposited on low alloy, high strength steel
     plates (ASTM A 517 Grade "F") with a com. flux-cored filler wire, Auto-MIG
     420, at different welding conditions.  Microstructure and mech. properties
     of welds were characterized by optical microscopy, SEM, TEM, EPMA,
     microhardness measurements, tensile tests, and Charpy impact tests.
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Hydrogen content of weld metals in as-weld condition and after exposing in simulated service condition was measured by LECO Gas Analyzer. Microstructure of weld metals consisted primarily of lath martensite with small amt. of M-A constituents (Martensite-Austenite alternating layers). For some particular welding conditions, such as higher heat input and lower preheat temps. etc., acicular ferrite is obsd. with lath martensite. Welds consisting of acicular ferrite in the microstructure showed improved mech. properties as well as lower hydrogen absorption. The study provides guidelines for selecting proper welding conditions, which results in lower propensity to absorb hydrogen during service, as well as better mech. properties. Necessity of post-weld heat treatment processes, which is mainly performed to achieve toughness, may be reduced; consequently saving cost and time of the welding process.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Akselsen, O	1988	21	344	Indian Weld J	
Albert, S	2003	28	383	Sadhana	CAPLUS
American Welding Societ	1972		63.11	AWS Welding Handbook	
Atkins, G	2002	81	61-s	Weld J	
Basu, B	2002	81	239s	Weld J	
Bhole, S	2006	173	92	J Mater Process Tech	CAPLUS
Dixon, B	1995	74	122s	Weld Res Suppl	
Gonzalez, J	1986	XII-9		Development of a Hig	
Grong, O	1986	31	27	Int Met Rev	CAPLUS
Grong, O	1994		1	Metallurgical Modell	
Jorge, J	2001	47	195	Mater Charact	CAPLUS
Lancaster, J	1993		211	Carbon and Ferritic	
Park, Y	2002	81	27s	Weld J	
Pound, G	1994			Evaluation of a Diff	
Shanmugam, S	2008	478	26	Mater Sci Eng A	
Shome, M	2006	37A	2159	Metall Mater Trans A	CAPLUS
Zhang, Z	1997	76	183-s	Weld Res Suppl	

IT 39392-20-6, ASTM A517F
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(base metal; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

RN 39392-20-6 CAPLUS

CN Iron alloy, base, Fe 96-97,Ni 0.70-1.00,Mn 0.60-1.00,Cr 0.40-0.65,Mo 0.40-0.60,Cu 0.15-0.50,Si 0.15-0.35,C 0.10-0.20,V 0.03-0.08,S 0-0.04,P 0-0.035,B 0.0005-0.006 (UNS K11576) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Mn	0.55	-	1.10	7439-96-5
Ni	0.67	-	1.03	7440-02-0
Cr	0.36	-	0.69	7440-47-3
Mo	0.36	-	0.64	7439-98-7
Cu	0.12	-	0.53	7440-50-8
Si	0.13	-	0.37	7440-21-3
C	0.08	-	0.22	7440-44-0
V	0.02	-	0.09	7440-62-2
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.006	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)

ST steel welding hydrogen absorption weld microstructure mech property

IT Welding of metals
(gas metal-arc welding; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT Absorption
(hydrogten; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT Fracture surface morphology

Heat treatment
Impact strength
Interfacial structure
Microhardness
Microstructure
Tensile strength
Welds
(optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT 1333-74-0, Hydrogen, processes
RL: OCU (Occurrence, unclassified); PEP (Physical, engineering or chemical process); OCCU (Occurrence); PROC (Process)
(absorption of; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT 39392-20-6, ASTM A517F
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(base metal; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT 190454-17-2, E110T5K4, processes 1351587-12-6, Auto-MIG 420
RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(filler wire; optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

IT 12173-93-2, Martensite, processes 12427-24-6, Ferrite (ferrous metal component)
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(optimal welding parameters, weld microstructure, mech. properties, and hydrogen absorption of high-strength steel plates)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 96 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2011:1066480 CAPLUS Full-text
DOCUMENT NUMBER: 155:662234
TITLE: Coating produced by deposition of nanoparticles blended wires
AUTHOR(S): Al Askandarani, A.; Hashmi, M. S. J.; Yilbas, B. S.
CORPORATE SOURCE: School of Mechanical and Manufacturing Eng., DCU, Dublin, Ire.
SOURCE: Advanced Materials Research (Durnten-Zurich, Switzerland) (2011), 264-265(Pt. 2, Advances in Materials and Processing Technologies II), 1476-1481
CODEN: AMREFI; ISSN: 1022-6680
DIGITAL OBJECT ID: 10.4028/www.scientific.net/AMR.264-265.1476
PUBLISHER: Trans Tech Publications Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Gas shield elec. arc coating of carbon steel surface is considered in relation to repair applications. Two types of wires are incorporated in the expts. including std. and nano-particle blended. The coating structure and the metallurgy are examd. using the SEM, and energy dispersive spectroscopy (EDS). The microhardness of the resulting coating is measured and compared with the results obtained from the conventional wire. It is found that fine structures are formed in the coating due to the presence of nanoparticles. In this case, microhardness increases significantly in the coating.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				www.castolin.com/wCa	
Gleiter, H	2000	48	1	Acta Materilia	CAPLUS
Guilemany, J	2002	153	107	Surface and Coating	CAPLUS
Jiang, H	1998	10	169	Nanostructured Mater	CAPLUS
Kimpel, A	2008	30	121	Achieves of Material	
Lima, R	2005	395	269	Materials Science an	

Miao, P |2007 |367-3|1197 |Journal of Nuclear M|CAPLUS
Stoica, V |2004 |31 |93 |J Thermal Spray Tech|
Wang, Y |2007 |262 |1097 |Wear |CAPLUS

IT 1338350-27-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating produced by deposition of nanoparticles blended wires)

RN 1338350-27-8 CAPLUS

CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (EnDOtec DO390N) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	33 - 100	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 10	7440-03-1
W	0 - 10	7440-33-7
B	0 - 5	7440-42-8
C	0 - 5	7440-44-0
Mn	0 - 5	7439-96-5
Si	0 - 2	7440-21-3

CC 55-9 (Ferrous Metals and Alloys)

ST nanoparticle blended wire deposition coating

IT Cables and Wires
Microhardness
Microstructure
Nanostructured materials
Welds
(coating produced by deposition of nanoparticles blended wires)

IT Welding of metals
(shielded metal-arc welding; coating produced by deposition of nanoparticles blended wires)

IT 11121-90-7, Carbon steel, processes 1338350-27-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(coating produced by deposition of nanoparticles blended wires)

L15 ANSWER 97 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2011:891773 CAPLUS Full-text

DOCUMENT NUMBER: 155:594781

TITLE: Neutron surface residual stress scanning using optimisation of a Si bent perfect crystal monochromator for minimising spurious strains

AUTHOR(S): Kornmeier, J. Rebelo; Gibmeier, J.; Hofmann, M.; Wimpory, R. C.

CORPORATE SOURCE: Helmholtz-Zentrum Berlin fuer Materialien u. Energie, Berlin, D-14109, Germany

SOURCE: Materials Science Forum (2011), 681(Residual Stresses VIII), 399-404
CODEN: MSFOEP; ISSN: 0255-5476

DIGITAL OBJECT ID: 10.4028/www.scientific.net/MSF.681.399

PUBLISHER: Trans Tech Publications Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB For non destructive stress anal. of surface treated steel samples the application of lab. X rays or high energy synchrotron radiation in reflection mode covers the region from some micrometers up to a depth of about 150 - 200 μm. To access depth regions deeper than 200 μm the incremental layer removal technique in combination with the repeated application of X-ray stress anal. for the newly generated surfaces can be used. However, this procedure is destructive, laborious and furthermore, it has to be checked whether corrections have to be applied due to stress relaxation. By using neutron radiation penetration depths generally up to several millimetres can be achieved non destructively. However neutron measurements are crit. at the surface. When scanning a sample surface,

aberration peak shifts caused by so called spurious strains arise due to the fact that the gauge vol. defined by the primary and secondary optics is partially outside of the sample. These aberration peak shifts can be of the same order of magnitude as the peak shifts related to residual strains. In this exemplary study it will be demonstrated that, by optimizing the bending radius of a Si (400) monochromator, the spurious surface strains can be strongly reduced when compared to the values obtained with a traditional Ge (311) mosaic monochromator, even when the gauge vol. is mainly out of the surface. The objective of the expts. is to find the optimal monochromator settings for the Si (400) monochromator at the STRESS-SPEC instrument at the research reactor FRM II, Munich, Germany. For the parametric studies a stress free steel sample of the fine grained construction steel, S690QL was used. The optimized conditions for the Si (400) monochromator that resulted from the systematic studies were applied to a shot peened plate of steel SAE 4140. The residual stress distribution is analyzed by means of through surface strain scanning. The residual stress gradient obtained is in very good agreement with the well characterised residual stress depth profile obtained within a round robin test in the scope of the BRITE-EURAM-project ENSPED (European Network of Surface and Prestress Engineering and Design). The results indicated that surface residual stress profiles can be measured with neutrons up to 200 μm underneath the surface without time consuming and laborious surface effect corrections.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Gibmeier, J	2009	52	209	Advances in X-Ray An	
Gibmeier, J	2002	404-4	659	Mat Sci Forum	CAPLUS
Hauk, V	1997			Structural and resid	
Hofmann, M	2006	385-3	1035	Physica B	
Hutchings, M	2005			Introduction to the	
Krawitz, A	2001			Introduction to diff	
Mayer, H	2000	347-3	29	Mat Sci Forum	
Noyan, I	1987			Residual Stress- Mea	
Ruppersberg, H	1989	116	681	Phys stat sol (a)	
Ruppersberg, H	1991	195	189	Z Kristallographie	
Spooner, S	1997	30	449	J Appl Cryst	CAPLUS
Vrana, M	2005	490-4	234	Materials Science Fo	
Wang, D					
Wang, X	1998	30	52	J Appl Cryst	
Webster, P	1995	3	223	J Neutron Research	
Withers, P	2000	292	273	Physica B	CAPLUS

IT 12604-89-6, S690QL, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(neutron surface residual stress scanning using optimization of silicon bent perfect crystal monochromator for minimizing spurious strains)

RN 12604-89-6 CAPLUS

CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3
Mo	0.18 - 0.28	7439-98-7
C	0.15 - 0.21	7440-44-0
Zr	0.05 - 0.15	7440-67-7
S	0 - 0.04	7704-34-9
P	0 - 0.035	7723-14-0
B	0 - 0.0025	7440-42-8

CC 55-12 (Ferrous Metals and Alloys)

IT 12604-89-6, S690QL, processes 12672-16-1, SAE 4140, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(neutron surface residual stress scanning using optimization of silicon bent perfect crystal monochromator for minimizing spurious strains)

L15 ANSWER 98 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2011:885118 CAPLUS Full-text
DOCUMENT NUMBER: 155:515651
TITLE: Study of selected properties of nanostructured hardfacings prepared by laser technique which are intended for machine parts with increased wear resistance under friction conditions
AUTHOR(S): Napadlek, Wojciech; Laber, Agnieszka
CORPORATE SOURCE: Inst. Pojazdow Mech. i Transportu, Wydz. Mech., Wojskowa Akad. Tech., Warsaw, 00-908, Pol.
SOURCE: Tribologia (2010), 41(5), 21-36
CODEN: TRYBDE; ISSN: 0208-7774
PUBLISHER: Oficyna Wydawnicza SIMPRESS
DOCUMENT TYPE: Journal
LANGUAGE: Polish
AB The prepn. of fine-grained hardfacings on 0H18N9 acid-resistant steel using Castolin EnDOtec DO390N flux-cored nanowire by the laser technique was lab. studied. The topog. of the surface of hardfacings for the selected parameters of the laser processing was presented. Numerous macro- and microcracks were found in the built-up metal. A fine-grained micro- and nanostructure with particles of high-vol. MC carbide phases and M23(BC) and M2B phases were arranged in the fine-grained Fe matrix. Taking into account multiple laser melting of the hardfacing layer, different chem. compns. were obsd. in microregions along with substantial microstructural inhomogeneity. Rockwell C hardness of the built-up metal was 68-72. The measurements of microhardness in the transverse section showed Vickers (HV0.1) values as high as 990-1100.
IT 1338350-27-8, EnDOtec DO390N
RL: NANO (Nanomaterial); TEM (Technical or engineered material use); USES (Uses)
(flux-cored nanowire; study of selected properties of nanostructured hardfacings prepd. by laser technique which are intended for machine parts with increased wear resistance under friction conditions)
RN 1338350-27-8 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (EnDOtec DO390N) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	33 - 100	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 10	7440-03-1
W	0 - 10	7440-33-7
B	0 - 5	7440-42-8
C	0 - 5	7440-44-0
Mn	0 - 5	7439-96-5
Si	0 - 2	7440-21-3

CC 55-9 (Ferrous Metals and Alloys)
Section cross-reference(s): 73
IT 1338350-27-8, EnDOtec DO390N
RL: NANO (Nanomaterial); TEM (Technical or engineered material use); USES (Uses)
(flux-cored nanowire; study of selected properties of nanostructured hardfacings prepd. by laser technique which are intended for machine parts with increased wear resistance under friction conditions)

L15 ANSWER 99 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2011:179230 CAPLUS Full-text
DOCUMENT NUMBER: 155:188560
TITLE: Edge layer condition and fatigue strength of welds improved by mechanical post-weld treatment
AUTHOR(S): Weich, I.
CORPORATE SOURCE: Ingenieursozietaet Peil, Ummenhofer und Partner, Karlsruhe, Germany
SOURCE: Welding in the World (2011), 55(1/2), 3-12
CODEN: WDWRAI; ISSN: 0043-2288
DIGITAL OBJECT ID: 10.1007/BF03263510

PUBLISHER: International Institute of Welding
DOCUMENT TYPE: Journal
LANGUAGE: English

AB In this paper, investigations about the beneficial effect of high frequency peening methods on the fatigue strength of welds are reported. Recent investigations prove that these methods are effective means of improving the fatigue strength of welded details. In the reported studies, the mode of functioning of these methods, as well as their beneficial effects on fatigue strength, have been exptl. and numerically analyzed and quantified. The results of the exptl. studies show that the benefit of high frequency peening methods relies on compressive residual stresses and surface hardening, caused by plastic deformation of the edge layers at the weld toes. The exptl.-detd. fatigue strength of new welds and that of already fatigue-pre-loaded welds before the treatment is improved by 80% to 100%, as compared with the as-welded condition. Based on the findings, a design model for post-weld treated welds is developed, which allows for the consideration of the beneficial effect of the post-weld treatment for the design of steel structures. The increased fatigue strength is considered in a local design concept, by introducing improvement factors for the local fatigue strength. The local compressive stresses are considered, as well as the local stress ratio.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Durr, A	2007			Dissertation, Univer	
Haagensen, R	2004			IIW-Document XIII-18	
Kuhlmann, U	2006			Efficient steel desi	
Lihavainen, V	2006			Dissertation, Lappee	
Nitschke-Pagel, T	2006			IIW Doc XIII-2099-06	
Roy, S	2006			Dissertation, Lehigh	
Ummenhofer, U	2005			IIW Document XIII-20	
Ummenhofer, U	2006		98	The Proceedings of t	
Weich, I	2009			Dissertation, Techni	
Wohlfahrt, H	2000		55	Mechanische Oberflac	
Wohlfahrt, H	1982		675	Shot Peening Proceed	

IT 12604-89-6, S690QL, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(edge layer condition and fatigue strength of welds improved by mech. post-weld treatment)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST edge layer condition fatigue strength weld mech postweld treatment
IT Butt welds
Compression
Crack initiation
Crack propagation
Plastic deformation
Residual stress
Shot peening
Stress relaxation
Surface hardening
Vickers hardness
Yield strength
(edge layer condition and fatigue strength of welds improved

by mech. post-weld treatment)
IT 12604-89-6, S690QL, processes 65682-90-8, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(edge layer condition and fatigue strength of welds improved by mech. post-weld treatment)
OS.CITING REF COUNT: 7 THERE ARE 7 CAPLUS RECORDS THAT CITE THIS RECORD (7 CITINGS)

L15 ANSWER 100 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2011:129061 CAPLUS Full-text
DOCUMENT NUMBER: 155:386474
TITLE: Arc spraying of nano-structured wire on carbon steel: examination of coating microstructures
AUTHOR(S): Al Askandarani, A.; Hashmi, M. S. J.; Yilbas, B. S.
CORPORATE SOURCE: School of Mechanical and Manufacturing Eng., DCU, Dublin, Ire.
SOURCE: AIP Conference Proceedings (2010), 1315(Pt. 2, International Conference on Advances in Materials and Processing Technologies, 2010), 1383-1388
CODEN: APCPCS; ISSN: 0094-243X
DIGITAL OBJECT ID: 10.1063/1.3552379
PUBLISHER: American Institute of Physics
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Arc spraying of nano-structured wire (TAFA 95MX) onto carbon steel is carried out. The workpieces coated were heat treated at temp. similar to the operating temp. of the hot-path components of power gas turbines. The morphol. and microstructural changes in the coating are examd. using optical and Scanning Electron Microscope (SEM). The surface roughness and microhardness of the resulting coatings are measured. It is found that the formation of dimples like structure at surface increased the surface roughness of the coating. The microhardness of the resulting coating is significantly higher than the base material hardness. Heat treatment does not alter the microstructure and microhardness of the coating. (c) 2010 American Institute of Physics.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Al Askandarani, A	2009			AMPT 2009 Conference	
Anon				www.praxair.com/prax	
Anon				www.praxairsurface.c	
Branagan, D	2005	14	196	J of Thermal Spray T	
Gedzevicius, I	2006	175	206	J of Materials Proce	CAPLUS
Gleiter, H	2000	48	1	Acta Mater	CAPLUS
Jiang, H	1998	10	169	Nanostructured Mater	CAPLUS
Klimpel, A	2008	30	121	Archives of Material	
Li, D	2009	255	3811	Applied Surface Scie	CAPLUS
Lima, R	2005	395	269	Materials Science an	
Miao, P	2007	367-3	1197	J of Nuclear Materia	CAPLUS
Morisada, Y	2009	505	157	Materials Science an	
Taha-al, Z	2009	209	3172	J Material Processin	CAPLUS
Yang, J	2004	229	2	Applied Surface Scie	CAPLUS
Yilbas, B	2005	57	193	Industrial Tribology	

IT 916826-46-5, 140 MXC
RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(examn. of coating microstructures for arc spraying of nano-structured wire on carbon steel)
RN 916826-46-5 CAPLUS
CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 40	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 9	7440-03-1

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    W         0  -   9        7440-33-7
    B         0  -   5        7440-42-8
    Mn        0  -   5        7439-96-5
    C         0  -   4        7440-44-0
    Si        0  -   2        7440-21-3

CC   55-6 (Ferrous Metals and Alloys)
ST   carbon steel nanostructure wire arc spraying coating microstructure
IT   Agglomeration
       Coating materials
     Heat treatment
     Microhardness
     Microstructure
     Nanostructured materials
     Spray coating process
     Surface roughness
     Temperature
        (examn. of coating microstructures for arc spraying of
        nano-structured wire on carbon steel)
IT   11121-90-7, Carbon steel, processes
     RL: MSC (Miscellaneous); PEP (Physical, engineering or chemical process);
     PRP (Properties); PROC (Process)
        (examn. of coating microstructures for arc spraying of
        nano-structured wire on carbon steel)
IT   916826-46-5, 140 MXC
     RL: NANO (Nanomaterial); PEP (Physical, engineering or chemical process);
     PRP (Properties); TEM (Technical or engineered material use); PROC
     (Process); USES (Uses)
        (examn. of coating microstructures for arc spraying of
        nano-structured wire on carbon steel)
OS.CITING REF COUNT:     2     THERE ARE 2 CAPLUS RECORDS THAT CITE THIS RECORD
                               (2 CITINGS)


L15  ANSWER 101 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2010:1562749  CAPLUS Full-text
DOCUMENT NUMBER:         154:48907
TITLE:                   Coated welding electrode with steel core and
                         lithium-comprising coating
INVENTOR(S):             Ehrhart, Gilles
PATENT ASSIGNEE(S):      l'Air Liquide, Societe Anonyme Pour l'Etude et
                         l'Exploitation des Procedes Georges Claude, Fr.; Air
                         Liquide Welding France; Lincoln Electric France SAS
SOURCE:                  Eur. Pat. Appl., 20 pp.
                         CODEN: EPXXDW
DOCUMENT TYPE:           Patent
LANGUAGE:                French
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    --------------------     --------
     EP 2260969           A1   20101215    EP 2010-163195           20100519
     EP 2260969           B1   20200304
     FR 2946554           A1   20101217    FR 2009-53830            20090610
     FR 2946554           B1   20120608
PRIORITY APPLN. INFO.:                     FR 2009-53830        A   20090610
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     --------------      ----  -------------   -----------
     EP 2260969           A1   Indeterminate   20201107
     EP 2260969           B1   Indeterminate   20201106
     FR 2946554           A1   Dead            20210916
     FR 2946554           B1   Dead            20210916
AB   The coated welding electrode is claimed with the central wire made of
     low-alloy steel comprising no more than 5% of alloying elements, for
     example, 0.001-4% chromium.  The coating comprises lithium in the amt.
     of 0.06-1% in the form of a salt or oxide.  The electrode is suitable for
     welding alloy steels comprising 3-20% of alloying elements, esp. of the
     vertical or angle seams.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
```

Air Liquide	2001			EP 1125673 A1	CAPLUS
Kobe Steel Ltd	1983			JP 58086997 A	
Kobe Steel Ltd	1983			JP 58141890 A	
Kobe Steel Ltd	1984			JP 59070494 A	
Kobe Steel Ltd	1985			JP 60261690 A	CAPLUS
Kobe Steel Ltd	1997			FR 2740715 A1	CAPLUS
Mashinostrojenija, T	1967			GB 1056171 A	
Soudure Autogene Franca	2005			EP 1570944 A1	CAPLUS

IT 1257792-80-5
RL: TEM (Technical or engineered material use); USES (Uses)
(electrode core wire lithium oxide chloride; coated welding electrode with steel core and lithium-comprising coating)
RN 1257792-80-5 CAPLUS
CN Iron alloy, base, Fe 90-100,Cr 0-4,W 0-2.5,Co 0-1.5,Mn 0-1.5,Mo 0-1,Ni 0-1,Si 0-0.5,V 0-0.5,C 0-0.2,B 0-0.1,N 0-0.1,Nb 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	90 - 100	7439-89-6
Cr	0 - 4	7440-47-3
W	0 - 2.5	7440-33-7
Co	0 - 1.5	7440-48-4
Mn	0 - 1.5	7439-96-5
Mo	0 - 1	7439-98-7
Ni	0 - 1	7440-02-0
Si	0 - 0.5	7440-21-3
V	0 - 0.5	7440-62-2
C	0 - 0.2	7440-44-0
B	0 - 0.1	7440-42-8
N	0 - 0.1	17778-88-0
Nb	0 - 0.1	7440-03-1

IPCI B23K0035-30 [I]; B23K0035-36 [I]; B23K0035-365 [I]; B23K0035-40 [I]; C22C0038-00 [I]
IPCR B23K0035-30 [I]; B23K0035-36 [I]; B23K0035-365 [I]; B23K0035-40 [I]; C22C0038-00 [I]
CC 55-9 (Ferrous Metals and Alloys)
ST steel welding electrode lithium coating
IT Coating materials
Welding electrodes
(coated welding electrode with steel core and lithium-comprising coating)
IT Feldspar-group minerals
RL: TEM (Technical or engineered material use); USES (Uses)
(lithium-comprising, electrode coating; coated welding electrode with steel core and lithium-comprising coating)
IT 554-13-2, Lithium carbonate 7447-41-8, Lithium chloride (LiCl), uses 7789-24-4, Lithium fluoride (LiF), uses 12057-24-8, Lithium oxide (Li2O), uses 12627-14-4, Lithium silicate
RL: TEM (Technical or engineered material use); USES (Uses)
(electrode coating; coated welding electrode with steel core and lithium-comprising coating)
IT 1257792-80-5
RL: TEM (Technical or engineered material use); USES (Uses)
(electrode core wire lithium oxide chloride; coated welding electrode with steel core and lithium-comprising coating)

L15 ANSWER 102 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2010:880522 CAPLUS Full-text
DOCUMENT NUMBER: 153:180874
TITLE: Process for manufacture of high tensile strength hot-dip galvanized steel sheet with uniform galvanized coating
INVENTOR(S): Yamanaka, Shintaro
PATENT ASSIGNEE(S): Nippon Steel Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 11pp.

```
                        CODEN: JKXXAF
DOCUMENT TYPE:          Patent
LANGUAGE:               Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:
     PATENT NO.         KIND  DATE        APPLICATION NO.          DATE
     ---------------    ----  --------    ---------------------    --------
     JP 2010156029       A    20100715    JP 2009-199              20090105
     JP 5594559          B2   20140924
PRIORITY APPLN. INFO.:                   JP 2009-199              20090105
PATENT STATUS PATENT INFORMATION:
     PATENT NO.         KIND  STATUS          STATUS DATE
     ---------------    ----  -------------   -----------
     JP 2010156029       A    Alive           20201121
     JP 5594559          B2   Alive           20201121
AB   The base steel comprises C 0.001-0.3, Si 0.5-2.0, Mn 1.0-3.0, P
     0.002-0.2, S 0.001-0.03, Al 0.005-1 wt.%, and balance Fe.  The manufg.
     process includes continuous hot-dip galvanization.  When a steel sheet
     is put into plating bath, the sheet temp. is 100-180° higher than
     the plating bath temp.  The plating bath temp. is kept 440-470°.
     Optionally the base steel contains total 0.05-1.0 wt.% Ti, Nb, B, Cr,
     and/or Mo.  The galvanized steel sheet has uniform galvanized coating
     and good appearance.
IT   1234653-91-8
     RL: TEM (Technical or engineered material use); USES (Uses)
        (base steel; manuf. of high tensile strength hot-dip
        galvanized steel sheet with uniform galvanized
        coating)
RN   1234653-91-8  CAPLUS
CN   Iron alloy, base, Fe 92-98,Mn 1-3,Si 0.5-2,Al 0-1,B 0-1,Cr 0-1,Mo 0-1,Nb
     0-1,Ti 0-1,C 0-0.3,P 0-0.2  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+============+===============
    Fe     92   -  98        7439-89-6
    Mn      1   -   3        7439-96-5
    Si      0.5 -   2        7440-21-3
    Al      0   -   1        7429-90-5
    B       0   -   1        7440-42-8
    Cr      0   -   1        7440-47-3
    Mo      0   -   1        7439-98-7
    Nb      0   -   1        7440-03-1
    Ti      0   -   1        7440-32-6
    C       0   -   0.3      7440-44-0
    P       0   -   0.2      7723-14-0

IPCI C23C0002-06 [I]; C23C0002-40 [I]; C22C0038-00 [I]; C22C0038-06 [I];
     C22C0038-38 [I]; C21D0009-46 [I]; C23C0002-06 [I]; C23C0002-40 [I];
     C22C0038-00 [I]; C22C0038-06 [I]; C22C0038-38 [I]; C21D0009-46 [I]
IPCR C23C0002-06 [I]; C21D0009-46 [I]; C22C0038-00 [I]; C22C0038-06 [I];
     C22C0038-38 [I]; C23C0002-40 [I]
CC   55-6 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   high tensile strength hot dip galvanized steel
IT   Hot-dip galvanizing
        (continuous; manuf. of high tensile strength hot-dip galvanized
        steel sheet with uniform galvanized coating)
IT   Galvanized steel
     RL: TEM (Technical or engineered material use); USES (Uses)
        (hot-dip; manuf. of high tensile strength hot-dip galvanized
        steel sheet with uniform galvanized coating)
IT   12697-71-1, uses   57923-89-4   144920-07-0, uses   797752-03-5, uses
     1234653-91-8   1234653-92-9, uses   1234653-94-1, uses
     1234653-96-3   1234653-97-4, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (base steel; manuf. of high tensile strength hot-dip
        galvanized steel sheet with uniform galvanized
        coating)

L15  ANSWER 103 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
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ACCESSION NUMBER: 2010:267926 CAPLUS Full-text
DOCUMENT NUMBER: 152:316673
TITLE: Aluminum-containing copper alloy-coated steel member and its manufacture by thermal diffusion of aluminum
INVENTOR(S): Fujii, Takahiro; Tadano, Masayoshi; Hiraoka, Masashi; Izumi, Keiji
PATENT ASSIGNEE(S): Nisshin Steel Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 9pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2010047791	A	20100304	JP 2008-211413	20080820
JP 5561920	B2	20140730		
PRIORITY APPLN. INFO.:			JP 2008-211413	20080820

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
JP 2010047791	A	Alive	20201121
JP 5561920	B2	Alive	20201121

AB The steel member has a Cu alloy coating layer with thickness 0.5-100 μm and Al content 1-15 wt.%. The coating layer may have compn. of Al 1-15, Ni ≤7, Fe ≤6, Cr ≤2, Mn ≤2 wt.%, and balance Cu at the center of the thickness. The manufg. process includes plating a steel substrate contg. 1-20 wt.% Al with Cu and heating at 600-1050° in nonoxidizing atm. for diffusion of Al from the substrate to the Cu plating layer. The Cu plating layer may be formed on a Ni undercoating layer by electrodeposition. The coating layer has good adhesion to the substrate. Al-contg. Cu alloy-coated steel members can be manufd. at a low cost and they have excellent resistance to oxidn., corrosion, and wear.

IT 1213779-75-9
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(substrate before diffusion; manuf. of Al-contg. Cu alloy-coated steel members by thermal diffusion of Al from steel substrate to Cu plating layer)

RN 1213779-75-9 CAPLUS
CN Iron alloy, base, Fe 0-99,Cr 0-35,Ni 0-24,Al 1-20,Cu 0-6,Mn 0-5,Mo 0-5,Si 0-3,B 0-1,C 0-1,Nb 0-1,Ti 0-1,V 0-1,N 0-0.5,Ca 0-0.1,Mg 0-0.1,misch metal 0-0.1,P 0-0.1,Y 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 99	7439-89-6
Cr	0 - 35	7440-47-3
Ni	0 - 24	7440-02-0
Al	1 - 20	7429-90-5
Cu	0 - 6	7440-50-8
Mn	0 - 5	7439-96-5
Mo	0 - 5	7439-98-7
Si	0 - 3	7440-21-3
B	0 - 1	7440-42-8
C	0 - 1	7440-44-0
Nb	0 - 1	7440-03-1
Ti	0 - 1	7440-32-6
V	0 - 1	7440-62-2
N	0 - 0.5	17778-88-0
Ca	0 - 0.1	7440-70-2
Mg	0 - 0.1	7439-95-4
Misch metal	0 - 0.1	8049-20-5
P	0 - 0.1	7723-14-0
Y	0 - 0.1	7440-65-5

IPCI C23C0010-28 [I]; C22C0009-01 [I]; C22C0009-06 [I]; C22C0009-00 [I]; C22C0009-05 [I]; C22C0038-00 [I]; C22C0038-58 [I]; C21D0009-46 [I]; C22C0038-06 [I]; C23C0010-28 [I]; C22C0009-01 [I]; C22C0009-06 [I]; C22C0009-00 [I]; C22C0009-05 [I]; C22C0038-00 [I]; C22C0038-58 [I];

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     C21D0009-46 [I]; C22C0038-06 [I]; C25D0005-26 [I]; C25D0005-50 [I]
IPCR C23C0010-28 [I]; C21D0009-46 [I]; C22C0009-00 [I]; C22C0009-01 [I];
     C22C0009-05 [I]; C22C0009-06 [I]; C22C0038-00 [I]; C22C0038-06 [I];
     C22C0038-58 [I]; C25D0005-26 [I]; C25D0005-50 [I]
CC   55-6 (Ferrous Metals and Alloys)
     Section cross-reference(s): 56
ST   aluminum copper alloy coated steel manuf diffusion
IT   Coating materials
        (abrasion-resistant; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   Abrasion-resistant materials
        (coatings; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   Anticorrosive coating materials
     Thermal diffusion
        (manuf. of Al-contg. Cu alloy-coated steel members
        by thermal diffusion of Al from steel substrate to Cu plating
        layer)
IT   Chemically resistant coating materials
        (oxidation-resistant; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   1213779-71-5P
     RL: IMF (Industrial manufacture); TEM (Technical or engineered material
     use); PREP (Preparation); USES (Uses)
        (coating; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   1213779-73-7   1213779-74-8
     RL: MSC (Miscellaneous)
        (coating; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   7440-50-8, Copper, processes
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
        (plating layer; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   12597-69-2, Steel, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (substrate after diffusion; manuf. of Al-contg. Cu alloy-coated
        steel members by thermal diffusion of Al from steel
        substrate to Cu plating layer)
IT   1197343-32-0   1213779-75-9   1213779-76-0   1213779-77-1
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
        (substrate before diffusion; manuf. of Al-contg. Cu alloy-
        coated steel members by thermal diffusion of Al from
        steel substrate to Cu plating layer)
IT   7440-02-0, Nickel, uses
     RL: TEM (Technical or engineered material use); USES (Uses)
        (undercoating layer; manuf. of Al-contg. Cu alloy-
        coated steel members by thermal diffusion of Al from
        steel substrate to Cu plating layer)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 104 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2009:1611816  CAPLUS Full-text
DOCUMENT NUMBER:         153:364550
TITLE:                   Fatigue behaviour of welded high-strength steels
                         after high frequency mechanical post-weld treatments
AUTHOR(S):               Weich, I.; Ummenhofer, T.; Nitschke-Pagel, Th.;
                         Dilger, K.; Eslami, H.
CORPORATE SOURCE:        Institute of Rehabilitation of Buildings and
                         Structures, University of Braunschweig, Germany
SOURCE:                  Welding in the World (2009), 53(11/12), R322-R332
                         CODEN: WDWRAI; ISSN: 0043-2288
DIGITAL OBJECT ID:       10.1007/BF03263475
PUBLISHER:               International Institute of Welding
```

DOCUMENT TYPE: Journal
LANGUAGE: English

AB Investigations have been carried out regarding the fatigue strength of welded details improved by high frequency treatment methods. These methods increase the fatigue strength by cold forming of the surface, so that the weld toe is smoothened, the surface hardness is increased and compressive residual stresses are present up to a depth of 1 to 1.5 mm. In this paper, the surface residual stresses at the weld toe are investigated before and after different loading conditions and for different steel grades. It is shown that only high tensile fatigue loading can lead to a slight residual stress relaxation for low-strength steels. The fatigue crack behavior is analyzed in more detail. The crack propagation rates with and without surface treatment are investigated, using defined lines of rest. The study shows that crack propagation in the edge layers is reduced. Several cracks may start in the UIT-treated zone but will not propagate further, until one final crack, often close to the edge of the specimens, will lead to failure. The results of fatigue tests for butt welds and longitudinal stiffeners improved by high frequency hammer peening are presented. The fatigue strength is seen to be doubled. For high-strength steels, the improvement at different load levels is identical, but for lower-strength steels, high stress ranges lead to reduced improvement. This fact results in flatter SN-curves and can be explained by the lower max. of residual stresses and residual stress relaxation.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	2005			Eurocode 3: Design o	
Cheng, X	2003	25	1259	International Journa	CAPLUS
Durr, A	2007			Dissertation, Univer	
Hanagarth, H	1989			Dissertation, Univer	
Heeschen, J	1990			Nitschke-Pagel Th, W	
Hobbacher, A	2009			Doc IIW-1823-07, exd	
Holzapfel, H	1994			Das Abbauverhalten k	
Kudryavtsev, Y	1995	7	667	The Paton Welding Jo	
Kuhlmann, U	2006			Effizienter Stahlbau	
Lihavainen, V	2006			Dissertation, Lappee	
Menig, R	2002			Dissertation, Univer	
Nitschke-Pagel, T	2007			IIW Doc XIII-2153-07	
Roy, S	2006			Dissertation, Lehigh	
Scholtes, B	1991			Eigenspannungen in m	
Statnikov, E	2002	46	20	Doc IIW-1506-00 (ex-	
Ummenhofer, T	2007	82	237	Bauingenieur	
Ummenhofer, T	2005			IIW Doc XIII-2085-05	
Ummenhofer, T	2007	76	643	Stahlbau	
Ummenhofer, U	2006		98	The Proceedings of t	
Vohringer, O	1983		49	Eigenspannungen - En	
Vohringer, O	1998			Stabilitat von Eigen	
Weich, I	2009			Dissertation, Techni	
Weich, I	2008			IIW Doc XIII-2218-08	
Wick, A	1999			Dissertation, Univer	

IT 12604-89-6, S690QL, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(fatigue behavior of welded high-strength steels after high frequency mech. post-weld treatments)

RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3
Mo	0.18 - 0.28	7439-98-7
C	0.15 - 0.21	7440-44-0
Zr	0.05 - 0.15	7440-67-7
S	0 - 0.04	7704-34-9
P	0 - 0.035	7723-14-0

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    B          0    -   0.0025        7440-42-8

CC   55-9 (Ferrous Metals and Alloys)
ST   frequency mech post weld treatment strength steel fatigue behavior
IT   Metal forming
        (Cold forming; fatigue behavior of welded high-strength steels
        after high frequency mech. post-weld treatments)
IT   Shot peening
        (Hammer; fatigue behavior of welded high-strength steels
        after high frequency mech. post-weld treatments)
IT   Crack propagation
     Fatigue, mechanical
     Mechanical hardness
     Microstructure
     Plastic deformation
     Residual stress
     Stress relaxation
     Welding of metals
     Welds
        (fatigue behavior of welded high-strength steels after high
        frequency mech. post-weld treatments)
IT   12604-89-6, S690QL, processes   65682-90-8, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (fatigue behavior of welded high-strength steels after high
        frequency mech. post-weld treatments)
OS.CITING REF COUNT:     6     THERE ARE 6 CAPLUS RECORDS THAT CITE THIS RECORD
                               (6 CITINGS)


L15  ANSWER 105 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2009:1460891  CAPLUS Full-text
DOCUMENT NUMBER:         151:574971
TITLE:                   Composite with a ballistic protective effect
INVENTOR(S):             Becker, Jens-Ulrik; Hofmann, Harald; Hoeckling,
                         Christian; Kern, Andreas; Schriever, Udo; Tamler,
                         Horst Walter; Tschersich, Hans-Joachim
PATENT ASSIGNEE(S):      ThyssenKrupp Steel Europe A.-G., Germany
SOURCE:                  Eur. Pat. Appl., 18pp.
                         CODEN: EPXXDW
DOCUMENT TYPE:           Patent
LANGUAGE:                German
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     --------------      ----  --------    ---------------------    --------
     EP 2123447           A1   20091125    EP 2008-103856           20080507
     EP 2123447           B1   20181226
     ES 2709433           T3   20190416    ES 2008-103856           20080507
     US 20120174752       A1   20120712    US 2009-436415           20090506
     US 8545993           B2   20131001
PRIORITY APPLN. INFO.:                    EP 2008-103856       A   20080507
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     --------------      ----  -------------   -----------
     EP 2123447           A1   Indeterminate   20201107
     EP 2123447           B1   Indeterminate   20201106
     ES 2709433           T3   Alive           20201121
     US 20120174752       A1   Alive           20201121
     US 8545993           B2   Alive           20201121
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The composite with a ballistic protective effect contains a 1st outer
     layer made of an alloy steel and ≥1 2nd layer made of an
     alloy steel which is arranged below the 1st layer.  The 1st alloy
     steel contains C 0.06-1.05, Si 0.05-1.65, Mn 0.3-2.65, Al 0.015-1.55, Cr
     ≤1.2, Ti ≤0.13, Mo ≤0.7, Nb ≤0.1, B
     ≤0.005, P ≤0.08, S ≤0.01, Ni ≤4.0, and V
     ≤0.5%.  The 2nd alloy steel contains C ≤1.0, Si
     ≤8.0, Mn 0.05-30.0, Al ≤10.0, Cr ≤10.0, Ti
     ≤0.5, Nb ≤0.5, B ≤0.1, V ≤0.5, Mo ≤5.0,
     P ≤0.1, S ≤0.03, N ≤0.3, Ni ≤8.0, Cu
     ≤3.0, and Sn ≤0.04%.  The 2nd layer has a higher
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elongation than that of the 1st layer. Typically, the composite is produced by roll plating. The composite has enhanced ballistic properties; decreased wall thicknesses of parts are required. The composite is esp. suitable for motor vehicles and structural parts.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Allegheny Ludlum Corp	1996			EP 0731332 A	CAPLUS
Boehler & Co Ag Geb	1976			GB 1444063 A	CAPLUS
Creusot Loire	1992			EP 0509854 A	CAPLUS
Grell Karl-Ludwig	1995			US 5418074 A	CAPLUS
Junius Hans-Toni	2003			US 20030029530 A1	CAPLUS
Leger Jacques	1993			US 5213905 A	CAPLUS
Liebowitz, B	1948			US 2438759 A	
Nippon Steel Corp	1994			JP 06093370 A	CAPLUS
Pircher Hans	1987			US 4645720 A	CAPLUS
Thyssenkrupp Steel Ag	2006			DE 102005006606 B3	
Voest Alpine Ag	1983			AT 372113 B	
Voest Alpine Ag	1987			EP 0247020 A	CAPLUS

IT 1196665-70-9
RL: TEM (Technical or engineered material use); USES (Uses)
(in prodn. of composite with ballistic protective effect)
RN 1196665-70-9 CAPLUS
CN Iron alloy, base, Fe 23-100,Mn 0-30,Al 0-10,Cr 0-10,Ni 0-8,Si 0-8,Mo 0-5,Cu 0-3,C 0-1,Nb 0-0.5,Ti 0-0.5,V 0-0.5,N 0-0.3,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	23 - 100	7439-89-6
Mn	0 - 30	7439-96-5
Al	0 - 10	7429-90-5
Cr	0 - 10	7440-47-3
Ni	0 - 8	7440-02-0
Si	0 - 8	7440-21-3
Mo	0 - 5	7439-98-7
Cu	0 - 3	7440-50-8
C	0 - 1	7440-44-0
Nb	0 - 0.5	7440-03-1
Ti	0 - 0.5	7440-32-6
V	0 - 0.5	7440-62-2
N	0 - 0.3	17778-88-0
B	0 - 0.1	7440-42-8
P	0 - 0.1	7723-14-0

IPCI B32B0015-01 [I]; C21D0009-42 [I]; F41H0005-04 [I]
IPCR B32B0015-01 [I]; C21D0009-42 [I]; F41H0005-04 [I]
CC 55-4 (Ferrous Metals and Alloys)
ST steel laminated composite
IT 1196665-67-4 1196665-70-9 1196665-73-2, uses 1196665-75-4
1196665-77-6 1196665-79-8
RL: TEM (Technical or engineered material use); USES (Uses)
(in prodn. of composite with ballistic protective effect)
OS.CITING REF COUNT: 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD (8 CITINGS)

L15 ANSWER 106 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2009:1157191 CAPLUS Full-text
DOCUMENT NUMBER: 151:581340
TITLE: A comparison of non-pulsed radiofrequency and pulsed radiofrequency glow discharge orthogonal time-of-flight mass spectrometry for analytical purposes
AUTHOR(S): Lobo, L.; Pisonero, J.; Bordel, N.; Pereiro, R.; Tempez, A.; Chapon, P.; Michler, J.; Hohl, M.; Sanz-Medel, A.
CORPORATE SOURCE: Department of Physical and Analytical Chemistry, Faculty of Chemistry, University of Oviedo, Oviedo, 33006, Spain

SOURCE: Journal of Analytical Atomic Spectrometry (2009), 24(10), 1373-1381
CODEN: JASPE2; ISSN: 0267-9477
DIGITAL OBJECT ID: 10.1039/b908038d
PUBLISHER: Royal Society of Chemistry
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The anal. potential of a radiofrequency glow discharge orthogonal time-of-flight mass spectrometer (RFGD-TOFMS) was evaluated in both pulsed and non-pulsed modes. A certified ref. steel was selected for this study. The operating conditions of the GD plasma (pressure and applied power) were optimized in terms of sensitivity. Addnl., duty cycle and pulse width parameters were studied in the pulsed RF mode. In this case, high analyte ion signals and improved signal to background ratios were measured after the end of the pulse, in the so-called afterglow domain. The analyte ion signals were normalized to sputtering rates to compare different operating conditions. The sensitivity in the pulsed mode was improved in comparison to the non-pulsed mode; however, the factor of enhancement is element dependent. Also, improved anal. performance was obtained in terms of ion sepn. capabilities as well as in terms of accuracy and precision in the evaluation of the isotopic ratios, using the pulsed RFGD-TOFMS. Addnl., depth profile analyses of a Zn/Ni coating on steel were performed and the non-pulsed and pulsed RFGD-TOFMS anal. performances were compared.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Bogaerts, A	1998	53	1	Spectrochim Acta, Pa	
Bogaerts, A	2000	55	263	Spectrochim Acta, Pa	
Chartier, F	2008	37	34	Spectra Analyse	CAPLUS
Fliegel, D	2006	386	169	Anal Bioanal Chem	CAPLUS
Harrison, W	2001	73	480A	Anal Chem	CAPLUS
Hohl, M	2008			Internal report of E	
Hohl, M	2006	38	292	Surf Interface Anal	CAPLUS
Jager, R	1997	358	214	Fresenius J Anal Che	CAPLUS
Klinger, J	1991	63	2571	Anal Chem	
Marcus, R	2003			Glow Discharge Plasm	
Martin, A	2007	62	1263	Spectrochim Acta Par	
Muniz, A	2008	23	1239	J Anal At Spectrom	CAPLUS
Oxley, E	2003	75	6478	Anal Chem	CAPLUS
Pisonero, J	2004	379	17	Anal Bioanal Chem	CAPLUS
Pisonero, J	2004	379	658	Anal Bioanal Chem	CAPLUS
Sola-Vazquez, A	2009	81	2591	Anal Chem	CAPLUS
Steiner, R	1999	14	1537	J Anal At Spectrom	CAPLUS
Tempez, A	2007		267	Proceedings of the 1	
Tuccitto, N	2009	23	549	Rapid Commun Mass Sp	CAPLUS
Wagatsuma, K	2002	17	1359	J Anal At Spectrom	CAPLUS
Winchester, M	2004	59	607	Spectrochim Acta, Pa	

IT 68467-45-8, NIST 1262b, analysis
RL: AMX (Analytical matrix); ANST (Analytical study)
(comparison of non-pulsed radiofrequency and pulsed radiofrequency glow discharge orthogonal time-of-flight mass spectrometry for anal. purposes)
RN 68467-45-8 CAPLUS
CN Steel, (AISI 94B17) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.75	-	1.00	7439-96-5
Ni	0.30	-	0.60	7440-02-0
Cr	0.30	-	0.50	7440-47-3
Si	0.15	-	0.35	7440-21-3
C	0.15	-	0.20	7440-44-0
Mo	0.08	-	0.15	7439-98-7
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.003	7440-42-8

CC 79-6 (Inorganic Analytical Chemistry)

IT 68467-45-8, NIST 1262b, analysis 98525-36-1, analysis
120599-23-7, NIST 1265a, analysis 162842-91-3
RL: AMX (Analytical matrix); ANST (Analytical study)
(comparison of non-pulsed radiofrequency and pulsed radiofrequency glow discharge orthogonal time-of-flight mass spectrometry for anal. purposes)
OS.CITING REF COUNT: 47 THERE ARE 47 CAPLUS RECORDS THAT CITE THIS RECORD (48 CITINGS)

L15 ANSWER 107 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2009:887390 CAPLUS Full-text
DOCUMENT NUMBER: 151:202847
TITLE: Method for manufacturing stamped coated steel products
INVENTOR(S): Drillet, Pascal; Spehner, Dominique; Kefferstein, Ronald
PATENT ASSIGNEE(S): ArcelorMittal France, Fr.
SOURCE: PCT Int. Appl., 27pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2009090555	A1	20090723	WO 2009-IB322	20090112
WO 2009090443	A1	20090723	WO 2008-IB79	20080115
CA 2713685	A1	20090723	CA 2009-2713685	20090112
CA 2713685	C	20120320		
KR 2010112602	A	20101019	KR 2010-7017170	20090112
EP 2242863	A1	20101027	EP 2009-701846	20090112
EP 2242863	B1	20140108		
CN 101910426	A	20101208	CN 2009-80102269	20090112
JP 2011512455	T	20110421	JP 2010-542705	20090112
JP 6146941	B2	20170614		
KR 2013008657	A	20130122	KR 2013-7000047	20090112
KR 1508861	B1	20150407		
RU 2499847	C2	20131127	RU 2010-134002	20090112
ES 2448551	T3	20140314	ES 2009-701846	20090112
BR 2009007223	A2	20150714	BR 2009-7223	20090112
BR 2009007223	B1	20170606		
MX 2010007428	A	20100903	MX 2010-7428	20100705
IN 2010CN04187	A	20110107	IN 2010-CN4187	20100706
IN 289869	B	20171201		

PRIORITY APPLN. INFO.:

WO 2008-IB79	A	20080115
KR 2010-7017170	A3	20090112
WO 2009-IB322	W	20090112

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2009090555	A1	Dead	20201203
WO 2009090443	A1	Dead	20201202
CA 2713685	A1	Alive	20201121
CA 2713685	C	Alive	20201120
KR 2010112602	A	Alive	20201121
EP 2242863	A1	Indeterminate	20201106
EP 2242863	B1	Indeterminate	20201107
CN 101910426	A	Dead	20201121
JP 6146941	B2	Alive	20201121
KR 2013008657	A	Alive	20201121
KR 1508861	B1	Alive	20201121
RU 2499847	C2	Alive	20201121
ES 2448551	T3	Alive	20201121
BR 2009007223	A2	Alive	20201121
BR 2009007223	B1	Alive	20201121
MX 2010007428	A	Alive	20201121

AB The invention relates to a process for making a hot stamped coated steel sheet product. The methods comprises the steps of pre-coating a steel strip or sheet by aluminum or aluminum-iron-silicon alloy, cutting said pre-coated strip to obtain a pre-coated steel blank, heating the blank in a furnace preheated to a temp. and during a time defined by diagram according to thickness, at a heating rate Vc of 4-12°/s

between 20 and 700° and at a heating rate Vc' of 1.5 and 6°/s between 500 and 700°, to obtain a heated blank. Further steps include transferring said heated blank to a die, hot stamping, cooling at a mean rate Vr of at least 30°/s between the exit of the heated blank from the furnace and down to 400°.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Kefferstein Ronald	2001			US 20010042393 A1	
Lorraine Laminage	2000			EP 0971044 A	CAPLUS
Nissan Motor	2004			EP 1380666 A	CAPLUS
Usinor	2003			FR 2833504 A	CAPLUS

IT 1173986-65-6
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. stamped coated steel products)
RN 1173986-65-6 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Cu	0 - 0.1	7440-50-8
Ni	0 - 0.1	7440-02-0
P	0 - 0.1	7723-14-0

IPCI C21D0008-02 [I]; C22C0038-32 [I]; C22C0038-38 [I]; B21D0053-26 [I]; C23C0002-12 [I]
IPCR C21D0008-02 [I]; B21D0053-26 [I]; C22C0038-32 [I]; C22C0038-38 [I]; C23C0002-12 [I]
CC 55-11 (Ferrous Metals and Alloys)
ST steel aluminum coating hot stamping
IT Hot-dip coating process
(method for manufg. stamped coated steel products)
IT Metalworking
(stamping, hot; method for manufg. stamped coated steel products)
IT 1173986-72-5
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(interdiffusion layer; method for manufg. stamped coated steel products)
IT 1173986-68-9
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermediate and superficial layer; method for manufg. stamped coated steel products)
IT 1173986-67-8 1173986-76-9
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermediate layer; method for manufg. stamped coated steel products)
IT 1173986-70-3 1173986-74-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermetallic layer; method for manufg. stamped coated steel products)
IT 952598-91-3 1058743-89-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(main coating; method for manufg. stamped coated steel products)

IT 1173986-65-6 1173986-66-7, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. stamped coated steel products)
IT 1173986-77-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(superficial layer; method for manufg. stamped coated steel products)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 108 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2009:887389 CAPLUS Full-text
DOCUMENT NUMBER: 151:202846
TITLE: Method for manufacturing stamped coated steel products
INVENTOR(S): Drillet, Pascal; Spehner, Dominique; Kefferstein, Ronald
PATENT ASSIGNEE(S): ArcelorMittal France, Fr.
SOURCE: PCT Int. Appl., 27pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2009090443	A1	20090723	WO 2008-IB79	20080115
CA 2713685	A1	20090723	CA 2009-2713685	20090112
CA 2713685	C	20120320		
WO 2009090555	A1	20090723	WO 2009-IB322	20090112
KR 2010112602	A	20101019	KR 2010-7017170	20090112
EP 2242863	A1	20101027	EP 2009-701846	20090112
EP 2242863	B1	20140108		
CN 101910426	A	20101208	CN 2009-80102269	20090112
JP 2011512455	T	20110421	JP 2010-542705	20090112
JP 6146941	B2	20170614		
KR 2013008657	A	20130122	KR 2013-7000047	20090112
KR 1508861	B1	20150407		
RU 2499847	C2	20131127	RU 2010-134002	20090112
ES 2448551	T3	20140314	ES 2009-701846	20090112
CN 104651590	A	20150527	CN 2014-10799052	20090112
BR 2009007223	A2	20150714	BR 2009-7223	20090112
BR 2009007223	B1	20170606		
ZA 2010004497	A	20110330	ZA 2010-4497	20100625
MX 2010007428	A	20100903	MX 2010-7428	20100705
IN 2010CN04187	A	20110107	IN 2010-CN4187	20100706
IN 289869	B	20171201		
US 20110006491	A1	20110113	US 2010-834162	20100712
US 8733142	B2	20140527		
US 8066829	B2	20111129	US 2011-13118077	20110527
US 20120064362	A1	20120315	US 2011-13301403	20111121
US 8440323	B2	20130514		
JP 2017159364	A	20170914	JP 2017-40554	20170303
JP 6588047	B2	20191009		

PRIORITY APPLN. INFO.:

WO 2008-IB79	A	20080115
CN 2009-80102269	A3	20090112
JP 2010-542705	A3	20090112
KR 2010-7017170	A3	20090112
WO 2009-IB322	W	20090112
US 2010-834162	A1	20100712

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2009090443	A1	Dead	20201202
CA 2713685	A1	Alive	20201121
CA 2713685	C	Alive	20201120
WO 2009090555	A1	Dead	20201203
KR 2010112602	A	Alive	20201121
EP 2242863	A1	Indeterminate	20201106
EP 2242863	B1	Indeterminate	20201107

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     CN 101910426          A    Dead            20201121
     JP 6146941            B2   Alive           20201121
     KR 2013008657         A    Alive           20201121
     KR 1508861            B1   Alive           20201121
     RU 2499847            C2   Alive           20201121
     ES 2448551            T3   Alive           20201121
     CN 104651590          A    Alive           20201120
     BR 2009007223         A2   Alive           20201121
     BR 2009007223         B1   Alive           20201121
     MX 2010007428         A    Alive           20201121
     US 20110006491        A1   Alive           20201121
     US 8733142            B2   Alive           20201121
     US 8066829            B2   Alive           20201120
     US 20120064362        A1   Alive           20201121
     US 8440323            B2   Alive           20201121
     JP 2017159364         A    Alive           20201121
     JP 6588047            B2   Alive           20201120
ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB   The invention relates to a process for making a hot stamped coated
     steel sheet product.  The methods comprises the steps of pre-coating a
     steel strip or sheet by aluminum or aluminum-iron-silicon alloy, cutting
     said pre-coated strip to obtain a pre-coated steel blank, heating
     the blank in a furnace preheated to a temp. and during a time defined by
     diagram according to thickness, at a heating rate Vc of 4-12°/s
     between 20 and 700° and at a heating rate Vc' of 1.5 and
     6°/s between 500 and 700°, to obtain a heated blank.
     Further steps include transferring said heated blank to a die, hot
     stamping, cooling at a mean rate Vr of at least 30°/s between the
     exit of the heated blank from the furnace and down to 400°.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
Kefferstein Ronald     |2001 |     |      |US 20010042393 A1   |
Lorraine Laminage      |2000 |     |      |EP 0971044 A        |CAPLUS
Nissan Motor           |2004 |     |      |EP 1380666 A        |CAPLUS
Usinor                 |2003 |     |      |FR 2833504 A        |CAPLUS
IT   1173986-65-6
     RL: PEP (Physical, engineering or chemical process); TEM (Technical or
     engineered material use); PROC (Process); USES (Uses)
        (method for manufg. stamped coated steel products)
RN   1173986-65-6  CAPLUS
CN   Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti
     0-0.2,Al 0-0.1,B 0-0.1,Cu 0-0.1,Ni 0-0.1,P 0-0.1  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
=========+=============+===============
    Fe     94    -  99        7439-89-6
    Mn      0.5 -   3        7439-96-5
    Cr      0   -   1        7440-47-3
    C       0.2 -   0.5      7440-44-0
    Si      0.1 -   0.5      7440-21-3
    Ti      0   -   0.2      7440-32-6
    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    Cu      0   -   0.1      7440-50-8
    Ni      0   -   0.1      7440-02-0
    P       0   -   0.1      7723-14-0

IPCI C21D0008-02 [I]; C22C0038-32 [I]; C22C0038-38 [I]; B21D0053-26 [I];
     C23C0002-12 [I]
IPCR C21D0008-02 [I]; B21D0053-26 [I]; C22C0038-32 [I]; C22C0038-38 [I];
     C23C0002-12 [I]
CC   55-11 (Ferrous Metals and Alloys)
ST   steel aluminum coating hot stamping
IT   Hot-dip coating process
        (method for manufg. stamped coated steel products)
IT   Metalworking
        (stamping, hot; method for manufg. stamped coated
        steel products)
IT   1173986-67-8   1173986-72-5
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RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(interdiffusion layer; method for manufg. stamped coated steel products)
IT 1173986-68-9
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermediate and superficial layers; method for manufg. stamped coated steel products)
IT 1173986-74-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermediate layer; method for manufg. stamped coated steel products)
IT 1173986-70-3 1173986-76-9
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(intermetallic layer; method for manufg. stamped coated steel products)
IT 952598-91-3 1058743-89-7
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(main coating; method for manufg. stamped coated steel products)
IT 1173986-65-6 1173986-66-7, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(method for manufg. stamped coated steel products)
IT 1173986-77-0
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(superficial layer; method for manufg. stamped coated steel products)
OS.CITING REF COUNT: 7 THERE ARE 7 CAPLUS RECORDS THAT CITE THIS RECORD (7 CITINGS)

L15 ANSWER 109 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2009:681313 CAPLUS Full-text
DOCUMENT NUMBER: 151:226765
TITLE: A comparison of residual stress in hammer-peened, multi-pass steel welds - A514 (S690Q) and S41500
AUTHOR(S): Simoneau, R.; Thibault, D.; Fihey, J.-L.
CORPORATE SOURCE: Institut de Recherche d'Hydro-Quebec, Varennes, QC, Can.
SOURCE: Welding in the World (2009), 53(5/6), R124-R134
CODEN: WDWRAI; ISSN: 0043-2288
DIGITAL OBJECT ID: 10.1007/BF03266717
PUBLISHER: International Institute of Welding
DOCUMENT TYPE: Journal
LANGUAGE: English
AB As part of a program to assess the in-situ weldability and mech. performance of the candidate high strength low alloy A514 (S690Q) steel as an alternative to the S41500 martensitic stainless steel for hydro-turbines, three aspects of the welds were studied: residual stress, Charpy toughness and cavitation erosion resistance. The exptl. set-up involved robotized gas metal arc welding (GMAW), performed on U-groove and double-V weld prepn. cut into 50 and 75 mm-thick steel plates. Half of the welds were robotically hammer-peened after each weld layer, except for the root pass. Strain gauges measured longitudinal and transverse strains during welding and hammer-peening. Once the weld cooled down to room temp., the strain gauges provided the surface residual stress level at their location. Two-dimensional, sub-surface, longitudinal, residual stress distributions were measured on cut sections with the contour method, using an optical profilometer. The results showed that hammer-peening completely eliminates the near-surface tensile welding residual stress on the A514 steel, whereas on the S41500 steel, the process is less useful due to the already beneficial effect of the low temp. martensitic transformation during weld cooling. Furthermore, hammer-peening the last weld layer confines tensile residual stress inside the weld, while inducing compressive stress at the weld surface. Charpy test results showed that the A514 weld presented better toughness

than the S41500 weld and comparable cavitation erosion resistance. Finally, hammer-peening showed a beneficial effect on cavitation resistance of the weld surface.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Busque, L	2005		22	Hydro Review	
Debiez, S	1990	118	58	CETIM informations	
Fihey, J	2005			High Strength Steels	
Hacini, L	2008	208	542	J Mater Process Tech	CAPLUS
Hammitt, F	1980			Cavitation and multi	
Heathcock, C	1982	81	311	Wear	
Mabelly, P	2001	14	553	Marine Structures	
Martinez, F	2004			Joining of advanced	
Ohta, A	2000	44	52	Doc IIW-1480-89, ex-	
Prime, M	2001	123	162	Journal of Engineeri	
Prime, M	2001		608	No publication given	
Prime, M	2003		891	Residual stress mapp	
Rao, S	1979	7	133	Journal of testing a	
Richman, R	1990	140	63	Wear	CAPLUS
Simoneau, R	1992			16the IAHR Symposium	
Simoneau, R	1991		211	The First ASME-JSME	
Simouneau, R	1987			Seven International	
Thibault, D	2009	209	2195	Journal of Materials	CAPLUS
Thiruvengadam, A	1974			Handbook of Cavitati	
Woodford, D	1972	3	1137	Metallurgical Transa	
Zenitani, S	2005	23	95	Quarterly Journal of	CAPLUS

IT 186511-13-7, S690Q
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(comparison of residual stress in hammer-peened, multi-pass steel welds, A514(S690Q) and S41500)
RN 186511-13-7 CAPLUS
CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8931) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 100	7439-89-6
Mn	0 - 1.70	7439-96-5
Ni	0 - 1.50	7440-02-0
Cr	0 - 1.00	7440-47-3
Si	0.15 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
Cu	0 - 0.50	7440-50-8
C	0 - 0.20	7440-44-0
V	0 - 0.12	7440-62-2
Nb	0 - 0.05	7440-03-1
P	0 - 0.025	7723-14-0
S	0 - 0.025	7704-34-9
B	0 - 0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST hammer peening multipass steel weld residual stress
IT Cooling
Elongation at break
Erosion resistance
Impact strength
Mechanical yield stress
Residual stress
Shot peening
Temperature
Vickers hardness
(comparison of residual stress in hammer-peened, multi-pass steel welds, A514(S690Q) and S41500)
IT Welding of metals
(gas metal-arc welding; comparison of residual stress in hammer-peened, multi-pass steel welds, A514(S690Q) and S41500)
IT 58353-80-3, E110 73215-57-3, S41500 76090-16-9, E410NiMo

186511-13-7, S690Q
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(comparison of residual stress in hammer-peened, multi-pass steel welds, A514(S690Q) and S41500)
OS.CITING REF COUNT: 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

L15 ANSWER 110 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2008:556603 CAPLUS Full-text
DOCUMENT NUMBER: 148:521251
TITLE: Coated steel strips, methods of making the same, methods of using the same, stamping blanks prepared from the same, stamped products prepared from the same, and articles of manufacture which contain such a stamped product
INVENTOR(S): Drillet, Pascal; Spehner, Dominique; Kefferstein, Ronald
PATENT ASSIGNEE(S): Arcelor France, Fr.
SOURCE: PCT Int. Appl., 43 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2008053273	A1	20080508	WO 2006-IB4019	20061030
CA 2668393	A1	20080508	CA 2006-2668393	20061030
CA 2668393	C	20130813		
EP 2086755	A1	20090812	EP 2006-842403	20061030
EP 2086755	B1	20171129		
KR 2009086970	A	20090814	KR 2009-7008891	20061030
KR 1327648	B1	20131112		
CN 101583486	A	20091118	CN 2006-80056246	20061030
CN 101583486	B	20140827		
JP 2010508438	T	20100318	JP 2009-533969	20061030
JP 5334854	B2	20131106		
RU 2395593	C1	20100727	RU 2009-114832	20061030
BR 2006022071	A2	20140527	BR 2006-22071	20061030
EP 3290199	A1	20180307	EP 2017-192410	20061030
EP 3290199	B1	20190821		
EP 3290200	A1	20180307	EP 2017-192418	20061030
EP 3587104	A1	20200101	EP 2019-185736	20061030
EP 3587105	A1	20200101	EP 2019-185743	20061030
ES 2754621	T3	20200420	ES 2017-192410	20061030
ZA 2009002611	A	20101027	ZA 2009-2611	20090416
MX 2009004453	A	20090511	MX 2009-4453	20090424
IN 2009CN02275	A	20100319	IN 2009-CN2275	20090424
IN 324293	B	20191108		
US 20110165436	A1	20110707	US 2011-447777	20110318
US 20130029172	A1	20130131	US 2012-13621015	20120915
US 9708683	B2	20170718		
US 20170260603	A1	20170914	US 2017-15606770	20170526
US 10550447	B2	20200204		
US 20190271055	A1	20190905	US 2019-16413774	20190516
US 10590507	B2	20200317		
US 20190271056	A1	20190905	US 2019-16413799	20190516
US 10961602	B2	20210330		
US 20190271057	A1	20190905	US 2019-16413825	20190516
US 11041226	B2	20210622		
US 20190271058	A1	20190905	US 2019-16414022	20190516
US 10597747	B2	20200324		
US 20190276912	A1	20190912	US 2019-16413729	20190516
US 10577674	B2	20200303		
US 20210262055	A1	20210826	US 2021-17319306	20210513

PRIORITY APPLN. INFO.:

EP 2006-842403	A3	20061030
EP 2017-192410	A3	20061030
WO 2006-IB4019	W	20061030
US 2011-447777	A3	20110318
US 2012-13621015	A1	20120915

US 2017-15606770 A1 20170526
US 2019-16413825 A1 20190516

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2008053273	A1	Dead	20201202
CA 2668393	A1	Alive	20201121
CA 2668393	C	Alive	20201121
EP 2086755	A1	Indeterminate	20201106
EP 2086755	B1	Indeterminate	20201106
KR 2009086970	A	Alive	20201120
KR 1327648	B1	Alive	20201121
CN 101583486	A	Alive	20201121
CN 101583486	B	Alive	20201120
JP 5334854	B2	Alive	20201120
RU 2395593	C1	Alive	20201121
BR 2006022071	A2	Alive	20201202
EP 3290199	A1	Indeterminate	20201107
EP 3290199	B1	Indeterminate	20201106
EP 3290200	A1	Alive	20201202
EP 3587104	A1	Alive	20201201
EP 3587105	A1	Alive	20201202
ES 2754621	T3	Alive	20201121
MX 2009004453	A	Alive	20201120
US 20110165436	A1	Alive	20201120
US 20130029172	A1	Alive	20201121
US 9708683	B2	Alive	20201121
US 20170260603	A1	Alive	20201120
US 10550447	B2	Alive	20201121
US 20190271055	A1	Alive	20201121
US 10590507	B2	Alive	20201121
US 20190271056	A1	Alive	20201121
US 10961602	B2	Alive	20210408
US 20190271057	A1	Alive	20210401
US 11041226	B2	Alive	20210701
US 20190271058	A1	Alive	20201120
US 10597747	B2	Alive	20201121
US 20190276912	A1	Alive	20201121
US 10577674	B2	Alive	20201121
US 20210262055	A1	Alive	20210902

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB Coated steel having a well defined and uniform thickness is useful and advantageous for prepg. products by hot stamping. Products prepd. by hot stamping such a steel are particularly advantageous when subjected to a subsequent spot welding step.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Arcelor France	2006			WO 2006097593 A	CAPLUS
Armco Inc	1990			EP 0356783 A2	CAPLUS
Bhp Steel Jla Pty Ltd	2003			EP 1336666 A	CAPLUS
Laurent Jean-Pierre	2001			US 6296805 B1	CAPLUS
Lorraine Laminage	1995			FR 2720079 A1	CAPLUS
Lorraine Laminage	1998			FR 2758571 A1	CAPLUS
Lorraine Laminage	2000			EP 1013785 A1	CAPLUS

IT 1022915-01-0
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(aluminum coated steel strips stamping blanks and articles of manuf. which contain such a stamped product)

RN 1022915-01-0 CAPLUS

CN Iron alloy, base, Fe 94-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0

```
    Si      0.1 -   0.5      7440-21-3
    Ti      0   -   0.2      7440-32-6
    Al      0   -   0.1      7429-90-5
    B       0   -   0.1      7440-42-8
    P       0   -   0.1      7723-14-0

IPCI B32B0015-00 [I]; C21D0009-46 [I]
IPCR B32B0015-00 [I]; C21D0009-46 [I]
CC   55-11 (Ferrous Metals and Alloys)
ST   aluminum coated steel strip stamping article spot welding
IT   Metalworking
       (stamping; aluminum coated steel strips stamping
       blanks and articles of manuf. which contain such a stamped product)
IT   7429-90-5, Aluminum, uses   952598-91-3, Aluminum 87-90, iron 2-4, silicon
     8-11
     RL: NUU (Other use, unclassified); USES (Uses)
       (aluminum coated steel strips stamping blanks and
       articles of manuf. which contain such a stamped product)
IT   1022915-01-0
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
       (aluminum coated steel strips stamping blanks and
       articles of manuf. which contain such a stamped product)
OS.CITING REF COUNT:     8     THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD
                               (8 CITINGS)


L15  ANSWER 111 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        2008:243314  CAPLUS Full-text
DOCUMENT NUMBER:         149:84346
TITLE:                   Erosion resistance of hard-facing deposits
AUTHOR(S):               Wesling, V.; Reiter, R.; Oligmueller, J.
CORPORATE SOURCE:        Institut fuer Schweisstechnik und Trennende
                         Fertigungsverfahren, TU Clausthal,
                         Clausthal-Zellerfeld, D-38678, Germany
SOURCE:                  Materialwissenschaft und Werkstofftechnik (2008),
                         39(1), 83-87
                         CODEN: MATWER; ISSN: 0933-5137
DIGITAL OBJECT ID:       10.1002/mawe.200700249
PUBLISHER:               Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE:           Journal
LANGUAGE:                German
AB   Erosive wear is inflicted by flying, bumping and furrowing particles
     inside the gaseous medium.  Esp. air vents - fan blades are the principal
     victims - and conveying systems are attacked by solid particle impingement
     if fly ash, raw-meal, cement or clinker are involved.  High load of
     particles in combination with high circular velocities cause enormous loss
     of material on exposed components.  Hardfacing deposits as produced by
     flux-cored arc and plasma trans-arc welding in form of wear plates or
     local overlays at pertinent places are able to diminish this effect.
     Secure dimensioning of above mentioned systems during project engineering
     status only is hardly possible.  So far solns. for wear protection are
     mainly based on time- and cost-intensive field tests on the part of the
     manufacturer or user of affected plants and equipment.  Within the
     framework of presented investigations experiences in lab. testing of
     hard-facing materials for attacked components are discussed.  Wear tests
     on platings by practically relevant media give information about
     influencing factors as well as wear- and damage-mechanism.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+===========
Fischer, A             |1984 |     |      |Fortschrittberichte |
Ibach, A               |1994 |     |      |Verschlei.BETA.verhalte|
Maratray, F            |1970 |     |      |Einflussfaktoren auf|
Pohl, C                |2005 |23   |      |DVS-Bericht         |
Schlag, P              |1991 |     |      |GVC-Tagung          |
Schreiber, F           |     |     |      |3. Verschlei.BETA.schut|
Tremmer, D             |1996 |176  |44    |DVS-Bericht         |
Uetz, H                |1986 |     |      |Abrasion und Erosion|
Wesling, V             |2006 |     |      |DGM-Arbeitskreis "Ma|
Wesling, V             |2006 |     |      |Fachtagung "Verschle|
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IT 12604-89-6, S690QL, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(substrate; erosion resistance of hardfacing coatings on steel substrates)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.10	7439-96-5
Cr	0.50 - 0.80	7440-47-3
Si	0.40 - 0.80	7440-21-3
Mo	0.18 - 0.28	7439-98-7
C	0.15 - 0.21	7440-44-0
Zr	0.05 - 0.15	7440-67-7
S	0 - 0.04	7704-34-9
P	0 - 0.035	7723-14-0
B	0 - 0.0025	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST erosion resistance hardfacing abrasion resistant coating steel; weld surfacing erosion resistant coating steel
IT Coating materials
(abrasion-resistant; erosion resistance of hardfacing coatings on steel substrates)
IT Abrasion-resistant materials
(coatings; erosion resistance of hardfacing coatings on steel substrates)
IT Erosion resistance
Hardfacing
Weld surfacing
(erosion resistance of hardfacing coatings on steel substrates)
IT Coating materials
(erosion-resistant; erosion resistance of hardfacing coatings on steel substrates)
IT 174394-21-9, NiBSi 1033439-59-6, Fe22Cr7Nb5C
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(coating; erosion resistance of hardfacing coatings on steel substrates)
IT 12604-89-6, S690QL, processes 57621-33-7, S235, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(substrate; erosion resistance of hardfacing coatings on steel substrates)

L15 ANSWER 112 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2006:898119 CAPLUS Full-text
DOCUMENT NUMBER: 146:66156
TITLE: An innovative turnover for the wire arc spraying technology
AUTHOR(S): Georgieva, P.; Thorpe, R.; Yanski, A.; Seal, S.
CORPORATE SOURCE: Praxair TAFA, Concord, NH, USA
SOURCE: International Thermal Spray & Surface Engineering (2006), 1(2), 68-69
Published in: Adv. Mater. Processes, 164(8)
CODEN: ITSSBS
PUBLISHER: ASM International
DOCUMENT TYPE: Journal
LANGUAGE: English
AB New Fe-based cored wires, with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B, designations 100MXC and 110MXC, resp., for thermal processing of nanostructured materials are described. The performance of the new wires was tested by wire arc spraying on steel. The nanostructured coatings have hardness values as high as 800-900 HV, very high d., and a fine homogeneously dispersed nanoparticles in the steel matrix. The high

strength of these new materials is attributed to their unique microstructure, caused by the assocd. phase transformation during fabrication.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Balani, K	2006	89	1419	J American Ceramic S	CAPLUS
Branagan, D	2005	14		J Mat Eng Performanc	CAPLUS
Chen, H	1990	28	10	Chinese J of Phys	
Koch, C	2002			Nanostructured Mater	
Koster, U	1981			Glassy Metals I, Ion	
Laha, T	2005	53	5429	Acta Materialia	CAPLUS
Mattern, N	2005			Microstructure Analy	
Seal, S	2004	29	16	MRS Bulletin	CAPLUS
Vishwanathan, V	2006	6	651	J Nanoscience and Na	

IT 916826-46-5, 140MXC
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

RN 916826-46-5 CAPLUS

CN Iron alloy, base, Fe,B,C,Cr,Mn,Mo,Nb,Si,W (140MXC) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 40	7439-89-6
Cr	0 - 20	7440-47-3
Mo	0 - 10	7439-98-7
Nb	0 - 9	7440-03-1
W	0 - 9	7440-33-7
B	0 - 5	7440-42-8
Mn	0 - 5	7439-96-5
C	0 - 4	7440-44-0
Si	0 - 2	7440-21-3

CC 55-6 (Ferrous Metals and Alloys)

ST iron cored wire arc spraying abrasion resistant nanostructured coating

IT Coating materials
(abrasion-resistant; new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

IT Abrasion-resistant materials
(coatings; new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

IT Adhesion, physical
Mechanical hardness
Microstructure
Nanostructures
(new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

IT Spray coating process
Thermal spray coating process
(wire arc; new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

IT 916826-43-2, 100MXC 916826-44-3, 110MXC 916826-45-4, 110MXC-V2
916826-46-5, 140MXC
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(new Fe-based cored wires with compns. Fe-C-B-Mo-W and Fe-Cr-Mo-W-B for wire arc spraying of abrasion-resistant nanostructured coatings)

L15 ANSWER 113 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 2006:322586 CAPLUS Full-text

DOCUMENT NUMBER: 144:354988

TITLE: Oxidation-resistant units and oxidation-resistant coating materials for turbines
INVENTOR(S): Yasutomi, Yoshiyuki; Kitaoka, Satoshi; Matsudaira, Tsuneaki; Kawashima, Naoki; Wada, Masashi; Sugita, Yuji; Kagitani, Yukio; Nakajo, Koji
PATENT ASSIGNEE(S): Fine Ceramics Center, Japan; Chubu Electric Power Co., Inc.
SOURCE: Jpn. Kokai Tokkyo Koho, 17 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006089796	A	20060406	JP 2004-275373	20040922
JP 4542857	B2	20100915		
PRIORITY APPLN. INFO.:			JP 2004-275373	20040922

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
JP 2006089796	A	Dead	20201121
JP 4542857	B2	Dead	20201120

AB The title unit is equipped with a structure body contg. an electron conducting region (R1) placed at oxidizing atm. side and an oxide layer placed at the oxidizing atm. side of R1, and a means for collecting neg. charge to R1. The region R1 may contain electron-conducting materials chosen from Ti, Ta, W, Ir, Pt-type alloys, heat-resistant steel contg. C 0-1, Si 0-3, Mn 0-2, Cr 0-30, Ni 0-50, Mo 0-10, W 0-8, Nb 0-5, Ti 0-5, Al 0-2, B 0-0.2, N 0-0.2, V 0-1, Cu 0-5, Zr 0-0.3 wt.%, Fe-based superalloys, Fe-Ni-Co-Cr alloys contg. C 0-0.5, Si 0-2, Mn 0-5, Cr 0-30, Ni 0-50, Co 0-50, Mo 0-10, W 0-8, Nb 0-5, Ti 0-5, Al 0-1, B 0-0.1, N 0-0.2, V 0-5, and Cu 0-5 wt.%, Co-based superalloys contg. C 0-1, Si 0-2, Mn 0-2, Ni 0-30, Cr 0-30, Mo 0-8, W 0-20, Nb 0-5, Ta 0-10, Ti 0-5, Al 0-0.5, Fe 0-5, B 0-0.5, Zr 0-2 wt.%, MCrAlR alloys (M = Ni, Co, and/or Fe; R = rare earth metals), TiC, TiN, TaC, TaN, LaCrO3, and LaCoO3. The unit provides high oxidn. resistance by ion blocking effects and elec. repulsion.

IT 881036-95-9 881036-96-0 881036-97-1
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; oxidn.-resistant units and coating materials having oxide surface for turbines)

RN 881036-95-9 CAPLUS
CN Iron alloy, base, Fe 0-100,Ni 0-50,Cr 0-30,Mo 0-10,W 0-8,Cu 0-5,Nb 0-5,Ti 0-5,Si 0-3,Al 0-2,Mn 0-2,C 0-1,V 0-1,Zr 0-0.3,B 0-0.2,N 0-0.2 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	0 - 100	7439-89-6
Ni	0 - 50	7440-02-0
Cr	0 - 30	7440-47-3
Mo	0 - 10	7439-98-7
W	0 - 8	7440-33-7
Cu	0 - 5	7440-50-8
Nb	0 - 5	7440-03-1
Ti	0 - 5	7440-32-6
Si	0 - 3	7440-21-3
Al	0 - 2	7429-90-5
Mn	0 - 2	7439-96-5
C	0 - 1	7440-44-0
V	0 - 1	7440-62-2
Zr	0 - 0.3	7440-67-7
B	0 - 0.2	7440-42-8
N	0 - 0.2	17778-88-0

RN 881036-96-0 CAPLUS
CN Iron alloy, base, Fe 0-100,Co 0-50,Ni 0-50,Cr 0-30,Mo 0-10,W 0-8,Cu 0-5,Mn 0-5,Nb 0-5,Ti 0-5,V 0-5,Si 0-2,Al 0-1,C 0-0.5,N 0-0.2,B 0-0.1 (9CI) (CA INDEX NAME)

Component	Component	Component

	Percent	Registry Number
Fe	0 - 100	7439-89-6
Co	0 - 50	7440-48-4
Ni	0 - 50	7440-02-0
Cr	0 - 30	7440-47-3
Mo	0 - 10	7439-98-7
W	0 - 8	7440-33-7
Cu	0 - 5	7440-50-8
Mn	0 - 5	7439-96-5
Nb	0 - 5	7440-03-1
Ti	0 - 5	7440-32-6
V	0 - 5	7440-62-2
Si	0 - 2	7440-21-3
Al	0 - 1	7429-90-5
C	0 - 0.5	7440-44-0
N	0 - 0.2	17778-88-0
B	0 - 0.1	7440-42-8

RN 881036-97-1 CAPLUS
CN Cobalt alloy, base, Co 0-100,Cr 0-30,Ni 0-30,W 0-20,Ta 0-10,Mo 0-8,Fe 0-5,Nb 0-5,Ti 0-5,Mn 0-2,Si 0-2,Zr 0-2,C 0-1,Al 0-0.5,B 0-0.5 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Co	0 - 100	7440-48-4
Cr	0 - 30	7440-47-3
Ni	0 - 30	7440-02-0
W	0 - 20	7440-33-7
Ta	0 - 10	7440-25-7
Mo	0 - 8	7439-98-7
Fe	0 - 5	7439-89-6
Nb	0 - 5	7440-03-1
Ti	0 - 5	7440-32-6
Mn	0 - 2	7439-96-5
Si	0 - 2	7440-21-3
Zr	0 - 2	7440-67-7
C	0 - 1	7440-44-0
Al	0 - 0.5	7429-90-5
B	0 - 0.5	7440-42-8

IPCI C23C0030-00 [I]; C22C0019-05 [I]; C22C0019-07 [I]; C22C0038-00 [I]; C22C0038-58 [I]; C23F0013-00 [I]; F01D0005-28 [I]; F01D0025-00 [I]; F02C0007-00 [I]; C23C0030-00 [I]; C22C0019-05 [I]; C22C0019-07 [I]; C22C0038-00 [I]; C22C0038-58 [I]; C23F0013-00 [I]; F01D0005-28 [I]; F01D0025-00 [I]; F02C0007-00 [I]
IPCR C23C0030-00 [I]; C22C0019-05 [I]; C22C0019-07 [I]; C22C0038-00 [I]; C22C0038-58 [I]; C23F0013-00 [I]; F01D0005-28 [I]; F01D0025-00 [I]; F02C0007-00 [I]
CC 56-10 (Nonferrous Metals and Alloys)
Section cross-reference(s): 55, 57
ST oxidn resistant oxide coating superalloy turbine
IT Turbines
(oxidn.-resistant units and coating materials having oxide surface for turbines)
IT Coating materials
(oxidn.-resistant; oxidn.-resistant units and coating materials having oxide surface for turbines)
IT Superalloys
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; oxidn.-resistant units and coating materials having oxide surface for turbines)
IT 7440-06-4, Platinum, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(neg. charge collector; oxidn.-resistant units and coating materials having oxide surface for turbines)
IT 1306-38-3, Ceria, uses 1309-48-4, Magnesia, uses 1314-20-1, Thorium oxide (ThO2), uses 1314-23-4, Zirconia, uses 1314-36-9, Yttria, uses 1314-61-0, Tantalum pentoxide 1344-28-1, Alumina, uses 12003-65-5, Aluminum lanthanum oxide (AlLaO3) 12004-39-6, Aluminum titanium oxide

(Al2TiO5) 12055-23-1, Hafnia 13463-67-7, Titania, uses 97330-34-2, Beryllium oxide (BeO2)
RL: TEM (Technical or engineered material use); USES (Uses)
(oxidn.-resistant units and coating materials having oxide surface for turbines)

IT 7439-88-5, Iridium, uses 12016-86-3, Cobalt lanthanum oxide (CoLaO3) 12017-94-6, Chromium lanthanum oxide (CrLaO3) 12033-62-4, Tantalum nitride (TaN) 12070-06-3, Tantalum carbide (TaC) 12070-08-5, Titanium carbide (TiC) 25583-20-4, Titanium nitride (TiN) 73283-66-6, CoNiCrAlY 881036-95-9 881036-96-0 881036-97-1
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; oxidn.-resistant units and coating materials having oxide surface for turbines)

OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 114 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2006:31898 CAPLUS Full-text
DOCUMENT NUMBER: 144:132328
TITLE: Annular concentrically twisted bead cord
INVENTOR(S): Sasabe, Hiroshi; Wakahara, Hitoshi; Okamoto, Kenichi
PATENT ASSIGNEE(S): Sumitomo(Sei) Steel Wire Corp., Japan; Sumitomo Electric Tochigi Co. Ltd.
SOURCE: PCT Int. Appl., 29 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006004054	A1	20060112	WO 2005-JP12227	20050701
JP 2006062641	A	20060309	JP 2005-177763	20050617
JP 3779313	B2	20060524		
EP 1764238	A1	20070321	EP 2005-765284	20050701
EP 1764238	B1	20100414		
CN 101039811	A	20070919	CN 2005-80020724	20050701
CN 100572110	C	20091223		
EP 2213485	A1	20100804	EP 2009-13332	20050701
KR 2007043812	A	20070425	KR 2007-7002311	20070130
US 7735307	B2	20100615	US 2007-629490	20070712

PRIORITY APPLN. INFO.:

JP 2004-198329	A	20040705
JP 2004-224303	A	20040730
JP 2005-177631	A	20050617
JP 2005-177763	A	20050617
EP 2005-765284	A3	20050701
WO 2005-JP12227	W	20050701

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
WO 2006004054	A1	Dead	20201202
JP 2006062641	A	Dead	20201209
JP 3779313	B2	Dead	20201209
EP 1764238	A1	Indeterminate	20201107
EP 1764238	B1	Indeterminate	20201106
CN 101039811	A	Alive	20201120
CN 100572110	C	Alive	20201120
EP 2213485	A1	Dead	20201202
KR 2007043812	A	Dead	20201121
US 7735307	B2	Alive	20201120

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT
AB An annular concentrically twisted bead cord reduced in wt. and cost and improved in molding properties and annular core corrosive resistance. The annular core is formed of a medium carbon steel or an alloy steel obtained by suppressing carbon content and adding the proper amts. of specified elements thereto. The diam. (dc) of the annular core to the diam. (ds) of peripheral wires meets the requirement of the expression, $1.04 \leq dc/ds \leq 1.30$, and the peripheral wires with a coil diam. of 0.5 to 1.3 times the coil diam. of the annular core are used to provide the bead cord reduced in wt. and cost and improved in molding properties. Also, an Al-Zn alloy plating or a thick Zn plating layer is

formed on the surface of the steel wire of the annular core or a stainless steel is used as the material of the annular core to increase the corrosive resistance of the annular core.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Fuji Seiko Kabushiki Ka	1989			JP 01-273707 A	
Fuji Seiko Kabushiki Ka	1992			JP 04-266506 A	
Kanai, H	1987			Microfilm of the spe	
Kobe Steel Ltd	1996			JP 08-188851 A	CAPLUS
Nippon Steel Corp	2001			JP 2001164337 A	CAPLUS
Nippon Steel Corp	2003			JP 2003129178 A	CAPLUS
Sumitomo Rubber Industr	2001			JP 2001301430 A	
Tokyo Rope Manufacturin	1993			JP 05-163686 A	
Toyo Tire And Rubber Co	1974			GB 1466114 A	
Toyo Tire And Rubber Co	1974			FR 2221290 A	
Toyo Tire And Rubber Co	1974			DE 2405127 A	
Toyo Tire And Rubber Co	1974			JP 49-102002 A	
Toyo Tire And Rubber Co	1975			JP 50-131201 A	

IT 873188-74-0
RL: NUU (Other use, unclassified); USES (Uses)
(annular concentrically twisted bead cord)
RN 873188-74-0 CAPLUS
CN Iron alloy, base, Fe 93-99,Mn 0.5-2,Si 0.3-2,Cr 0.2-2,C 0.1-0.3,Al 0-0.1,B 0-0.1,Mg 0-0.1,Nb 0-0.1,Ti 0-0.1,V 0-0.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 99	7439-89-6
Mn	0.5 - 2	7439-96-5
Si	0.3 - 2	7440-21-3
Cr	0.2 - 2	7440-47-3
C	0.1 - 0.3	7440-44-0
Al	0 - 0.1	7429-90-5
B	0 - 0.1	7440-42-8
Mg	0 - 0.1	7439-95-4
Nb	0 - 0.1	7440-03-1
Ti	0 - 0.1	7440-32-6
V	0 - 0.1	7440-62-2

IPCI B60C0015-04 [ICM,7]; B60C0009-00 [ICS,7]; C22C0038-00 [ICS,7]; C22C0038-18 [ICS,7]; C22C0038-54 [ICS,7]; D07B0001-06 [ICS,7]
CC 55-3 (Ferrous Metals and Alloys)
ST steel annular concentrically twisted bead cord aluminum zinc coating
IT Coating materials
Cords
(annular concentrically twisted bead cord)
IT 11107-04-3 11109-50-5 11121-90-7, Carbon steel, uses 12597-68-1, Stainless steel, uses 12597-69-2, Steel, uses 12709-14-7, uses 12709-21-6, uses 37261-75-9, uses 39286-11-8, uses 873188-71-7, uses 873188-72-8, uses 873188-73-9, uses 873188-74-0
RL: NUU (Other use, unclassified); USES (Uses)
(annular concentrically twisted bead cord)
IT 7440-66-6, Zinc, uses 11149-84-1
RL: NUU (Other use, unclassified); USES (Uses)
(coating; annular concentrically twisted bead cord)
OS.CITING REF COUNT: 4 THERE ARE 4 CAPLUS RECORDS THAT CITE THIS RECORD (10 CITINGS)

L15 ANSWER 115 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2004:849470 CAPLUS Full-text
DOCUMENT NUMBER: 142:9461
TITLE: Cold-crack testing for high-strength fine-grain structural steels
AUTHOR(S): Zimmer, P.; Kannengiesser, Th.; Florian, W.; Boellinghaus, Th.
CORPORATE SOURCE: Berlin, Germany
SOURCE: DVS-Berichte (2004), 232(Schweissen und Schneiden

2004), 207-214
CODEN: DVSBA3; ISSN: 0418-9639
PUBLISHER: Verlag fuer Schweissen und Verwandte Verfahren
DVS-Verlag
DOCUMENT TYPE: Journal
LANGUAGE: German
AB The H2 environment-related cold-crack reliability of single-layer fillet welds is studied. The welds are produced by using metal active gas welding, S690Q and S1100QL fine-grained base metal steel grades, and filler metal Union NiMoCr and Union X96. A time-strain-fracture diagram is derived for evaluating the crack risk. The true elongation at rupture has proven the suitable parameter for describing the effect of H2 environment on weld reliability for different weld microstructure states.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Aune, R	1996			Dissertation, Hambur	
Boellinghaus, T	1997		624	Calculation of Restr	
Boellinghaus, T	1997		606	Calculations of Rest	
Boellinghaus, T	2000	56	611	Corrosion	CAPLUS
Boellinghaus, T	1997			Mathematical Modelli	
Dieter, G	1988		S283	Mechanical Metallurg	
Ewald, J	1977			Schweien und Schneid	
Hoffmeister, H	1999		275	Proc EuroCorr	
Nelson, H	1983	25	275	Hydrogen Embrittleme	CAPLUS
Oriani, R	1972		76	Berichte der Bunsen	
Paltsevich, A				IIW-Doc II-A-749-88	
Satoh	1973	11	133	Welding in the World	
Seeger, D	2004			Corrosion, paper 041	
Thomich, W	1983		S497	Stahl und Eisen	
Wohlfahrt, H				Abschlubericht zum D	

IT 186511-13-7, S690Q
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(cold-crack testing for high-strength fine-grain structural steel welds)
RN 186511-13-7 CAPLUS
CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8931) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	93	-	100	7439-89-6
Mn	0	-	1.70	7439-96-5
Ni	0	-	1.50	7440-02-0
Cr	0	-	1.00	7440-47-3
Si	0.15	-	0.80	7440-21-3
Mo	0	-	0.60	7439-98-7
Cu	0	-	0.50	7440-50-8
C	0	-	0.20	7440-44-0
V	0	-	0.12	7440-62-2
Nb	0	-	0.05	7440-03-1
P	0	-	0.025	7723-14-0
S	0	-	0.025	7704-34-9
B	0	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST structural steel weld cold cracking; hydrogen embrittlement cold crack steel weld
IT Crack (fracture)
Fracture (materials)
Microstructure
Testing of materials
Welds
(cold-crack testing for high-strength fine-grain structural steel welds)
IT Embrittlement
(hydrogen; cold-crack testing for high-strength fine-grain structural steel welds)

IT Welding of metals
(metal-active gas; cold-crack testing for high-strength fine-grain structural steel welds)
IT 186511-13-7, S690Q 629615-32-3, S1100QL
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(cold-crack testing for high-strength fine-grain structural steel welds)
IT 1333-74-0, Hydrogen, processes
RL: OCU (Occurrence, unclassified); PEP (Physical, engineering or chemical process); OCCU (Occurrence); PROC (Process)
(embrittlement; cold-crack testing for high-strength fine-grain structural steel welds)

L15 ANSWER 116 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2002:810258 CAPLUS Full-text
DOCUMENT NUMBER: 137:327828
TITLE: Crack initiation and crack propagation of fasteners under fatigue loading
AUTHOR(S): Berger, C.; Kaiser, B.; Kremer, U.
CORPORATE SOURCE: Darmstadt, D-64283, Germany
SOURCE: Materialwissenschaft und Werkstofftechnik (2002), 33(9), 507-510
CODEN: MATWER; ISSN: 0933-5137
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal
LANGUAGE: German
AB In this investigation the fatigue strength of fasteners under variation of the property class, the sequence of manufg., the coating and the kind of lubrication, was detd. Thereby the crack initiation and the crack propagation of the individual variations were obsd. by suitable measurement instrumentation. As a result of the investigation the S-N curves for crack initiation and for fracture of the different variations of fasteners are presented.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Blauel, J	1988			FKM-Vorhaben	
Kaiser, B	1995	37	14	Materialprufung	
Kloos, K	1994	36	177	Materialprufung	CAPLUS
Kloos, K	1994	36	350	Materialprufung	CAPLUS
Kloos, K	1996	38	250	Schwingfestigkeit vo	CAPLUS
Kloos, K	1995		21	Tagung des DVM-Arbei	
Kloos, K	1979	122	127	VDI-Z	
Kloos, K	1986	128	101	VDI-Z	
Kloos, K	1991	133	86	VDI-Z	
Kussmaul, K	1991		29	VDI-Berichte	
Matheck, C	1987	57	73	Der Maschinenschaden	
Munz, D	1988		187	VDI-Berichte	
Schneider, W	1991			Dissertation, TH Dar	
Thomala, W	1978			Dissertation, TH Dar	
Yotobori, T	1976	8	81	Engineering Fracture	

IT 141808-70-0, 32CrB4, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(crack initiation and propagation of steel fasteners under fatigue loading)
RN 141808-70-0 CAPLUS
CN Steel, (DIN 1.7076) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Cr	0.90	-	1.20	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0	-	0.40	7440-21-3
C	0.29	-	0.36	7440-44-0
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9

```
    B          0.0008 -   0.0050        7440-42-8

CC   55-12 (Ferrous Metals and Alloys)
ST   fatigue steel fastener crack initiation propagation
IT   Crack initiation
     Crack propagation
     Fasteners
     Fatigue, mechanical
     Fracture (materials)
        (crack initiation and propagation of steel fasteners under
        fatigue loading)
IT   141808-70-0, 32CrB4, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (crack initiation and propagation of steel fasteners under
        fatigue loading)


L15  ANSWER 117 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:         2001:916938  CAPLUS Full-text
DOCUMENT NUMBER:          136:72669
TITLE:                    Acceleration of diffusion saturation processes in
                          nonisothermal thermochemical treatment
AUTHOR(S):                Gyulikhandanov, E. L.; Khaidorov, A. D.
CORPORATE SOURCE:         St. Petersburg State Technical University, St.
                          Petersburg, Russia
SOURCE:                   Metal Science and Heat Treatment (Translation of
                          Metallovedenie i Termicheskaya Obrabotka Metallov)
                          (2001), 43(5-6), 228-232
                          CODEN: MHTRAN; ISSN: 0026-0673
PUBLISHER:                Kluwer Academic/Consultants Bureau
DOCUMENT TYPE:            Journal
LANGUAGE:                 English
AB   Various of nonisothermal processes of carburizing, nitrocarburizing, and
     nitriding were studied.  The steels 20KhGNR, 40Kh, and 40KhMFA were
     investigated.  The diffusion satn. were performed by carburizing with an
     additive of 5% NH3, high-temp. nitrocarburizing in a mixt. of 50% natural
     gas and 50% NH3, and nitriding in NH3.  In all the cases thermochem.
     treatment (TCT) was not conducted by preliminary heat treatment.  The
     thickness of the diffusion layers and their structure and properties
     were detd.  The measurement of the diffusion layers involved in
     low-temp. nitrocarburizing and nitriding was carried out by durometry.  It
     was assumed that the boundary between the layer and the core had a
     microhardness of 300 HV and exceeded somewhat the hardness of the core of
     the studied steels.  The efficiency of nonisothermal and combined TCT
     multiplicity of the growth of the layer equal to the ratio of the
     effective thickness of the layers obtained in nonisothermal and
     isothermal regimes.  Using combined regimes of thermochem. treatment that
     included thermocycling and isothermal stages, a substantial acceleration
     of the diffusion process was detected which increased considerably the
     thickness of the diffusion layer.  A method was suggested that enabled
     to calc. the kinetics of nonisothermal processes of TCT according to the
     model of single-phase diffusion with the use of effective diffusivities.
RETABLE
   Referenced Author   |Year | VOL | PG   | Referenced Work    | Referenced
         (RAU)         |(RPY)|(RVL)|(RPG) |      (RWK)         | File
=======================+=====+=====+======+====================+============
Gyulikhandanov, E      |1992 |     |2     |Metalloved Term Obra|
Shmykov, A             |1991 |     |      |Thermodynamics and K|
IT   37312-00-8, 20KhGNR
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
        (diffusion satn. processes in nonisothermal thermochem. treatment of
        steel)
RN   37312-00-8  CAPLUS
CN   Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si
     0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S
     0-0.035,Ti 0-0.03,B 0.001 (20KhGNR)  (CA INDEX NAME)

Component        Component          Component
                  Percent         Registry Number
=========+=======================+================
```

Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST steel carburizing nitrocarburizing nitriding microstructure diffusion
IT Carbonitriding
Carburizing
Diffusion
Nitriding
(diffusion satn. processes in nonisothermal thermochem. treatment of steel)
IT Microstructure
(diffusion satn. processes in nonisothermal thermochem. treatment of steel in relation to)
IT 37312-00-8, 20KhGNR 39344-94-0, 40Kh, processes 64721-16-0, 40KhMFA
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(diffusion satn. processes in nonisothermal thermochem. treatment of steel)
IT 7664-41-7, Ammonia, uses
RL: NUU (Other use, unclassified); USES (Uses)
(diffusion satn. processes in nonisothermal thermochem. treatment of steel in relation to use of)

L15 ANSWER 118 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2000:113096 CAPLUS Full-text
DOCUMENT NUMBER: 132:230489
TITLE: Equipment for nitriding in pulsating current plasma
AUTHOR(S): Dostanko, A. P.; Bosyakov, M. N.; Bondarenko, S. V.; Grunskii, D. I.; Zhuk, D. V.; Kukharev, S. A.; Matusevich, P. A.; Savilov, A. V.
CORPORATE SOURCE: Beloruss. Gos. Univ. Inform. i Radioelektron., Minsk, 220027, Belarus
SOURCE: Elektronnaya Obrabotka Materialov (1999), (3), 66-69
CODEN: EOBMAF; ISSN: 0013-5739
PUBLISHER: Institut Prikladnoi Fiziki AN Respubliki Moldova
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The characteristics of the installation for hardening ion nitriding treatment in plasma of a pulsating current are adduced. The main advantages of processing in pulsating plasma with ref. to constructional and tool steels in comparison with gas nitriding are discussed. The summary table for different types of processed details., marks of steels, and characteristics of nitriding layer - depth and surface hardness is adduced.
IT 12742-15-3, 20KhNR
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(equipment for nitriding in pulsating current plasma of steels and coating properties)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number

Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 76-11 (Electric Phenomena)
Section cross-reference(s): 55
ST equipment nitriding pulsating current plasma steel
IT Apparatus
Coating materials
Hardness (mechanical)
Plasma nitriding
(equipment for nitriding in pulsating current plasma of steels and coating properties)
IT 7440-37-1, Argon, uses
RL: NUU (Other use, unclassified); USES (Uses)
(equipment for nitriding in pulsating current plasma of steels and coating properties)
IT 1333-74-0, Hydrogen, processes 7727-37-9, Nitrogen, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(equipment for nitriding in pulsating current plasma of steels and coating properties)
IT 12604-95-4, 38KhMYuA 12631-59-3, 40KhN2MA 12681-03-7, 20KhN3A 12718-23-9, 18KhGT 12725-23-4, R6M5 12731-80-5, 38KhMA, properties 12741-57-0, 4Kh5MFS 12741-70-7, Kh 12 12741-98-9, 25KhGT 12742-00-6, Kh12M 12742-05-1, 40KhN 12742-15-3, 20KhNR 12742-29-9, 4Kh5V2FS 12773-74-9, 35KhGSA 12784-22-4, 12Kh2N4A 37203-00-2, 4Kh4VMFS 37245-26-4, 30Kh13 37268-90-9, Steel 45, properties 37311-99-2, 40KhGNM 37323-42-5, 30KhGT 37323-91-4, 5KhNM 37329-39-8, 20Kh, properties 37329-44-5, R9K10 37360-28-4, 3Kh2V8 39344-94-0, 40Kh, properties 50947-86-9, 40Kh9S2 54790-83-9, 55Kh20G9AN4 61431-72-9, 15KhGN2TA 67540-49-2, 3Kh3M3F 68445-91-0, 20KhGNMTA 72026-34-7, 15KhF, properties 83653-82-1, 5KhNMF
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(equipment for nitriding in pulsating current plasma of steels and coating properties)

L15 ANSWER 119 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 2000:34644 CAPLUS Full-text
DOCUMENT NUMBER: 132:96225
TITLE: Coated hot-rolled and cold-rolled steel sheet with high strength and corrosion resistance after heat treatment
INVENTOR(S): Laurent, Jean-Pierre; Devroc, Jacques; Hennechart, Jean-Paul; Spehner, Dominique; Laminage, Lorraine
PATENT ASSIGNEE(S): Sollac, Fr.
SOURCE: Eur. Pat. Appl., 7 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 971044	A1	20000112	EP 1999-401690	19990707
EP 971044	B1	20030514		
FR 2780984	A1	20000114	FR 1998-8793	19980709
FR 2780984	B1	20010622		
CA 2276911	A1	20000109	CA 1999-2276911	19990707
CA 2276911	C	20090505		

AT 240419	T	20030515	AT 1999-401690		19990707
PT 971044	E	20030829	PT 1999-401690		19990707
ES 2196740	T3	20031216	ES 1999-401690		19990707
BR 9902712	A	20000308	BR 1999-2712		19990708
JP 2000038640	A	20000208	JP 1999-195664		19990709
JP 3931251	B2	20070613			
US 6296805	B1	20011002	US 1999-350100		19990709
US 44153	E1	20130416	US 2011-13205126		20110808
US 44940	E1	20140610	US 2013-13863100		20130415
PRIORITY APPLN. INFO.:			FR 1998-8793	A	19980709
			US 1999-350100	E	19990709
			US 2011-13205126	A1	20110808

PATENT STATUS PATENT INFORMATION:

PATENT NO.	KIND	STATUS	STATUS DATE
EP 971044	A1	Dead	20201106
EP 971044	B1	Dead	20201106
FR 2780984	A1	Dead	20201107
FR 2780984	B1	Dead	20201106
CA 2276911	A1	Dead	20201107
CA 2276911	C	Dead	20201106
AT 240419	T	Dead	20201106
PT 971044	E	Dead	20201107
ES 2196740	T3	Dead	20201106
BR 9902712	A	Dead	20201107
JP 2000038640	A	Dead	20201107
JP 3931251	B2	Dead	20201106
US 6296805	B1	Dead	20201107

ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB A hot-rolled and cold-rolled steel sheet contg. C 0.15-0.5, Mn 0.5-3, Si 0.1-0.5, Cr 0.01-1, Ti ≤0.2, Al ≤0.1, P ≤0.1, S ≤0.05, and B 0.0005-0.08% is coated in a molten Al bath, heated at 5-600°/s, and annealed above 750°. The coated sheet has a high strength, shock-, fatigue-, abrasion-, wear-, and corrosion resistance, and adhesion to paints and adhesives.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1989			JP 01176056 A	CAPLUS
Anon	1989			FR 2625227 A	CAPLUS
Anon	1990			JP 02263954 A	CAPLUS
Anon	1993			JP 05247588 A	CAPLUS
Anon	1993			GB 2261879 A	CAPLUS
Anon	1993			FR 2684392 A	CAPLUS
Anon	1993			DE 4143270 A	CAPLUS
Anon	1993			US 5178688 A	CAPLUS
Anon	1994			JP 06179944 A	CAPLUS
Anon	1994			JP 6093375 A	
Anon	1994			KR 9402139 B	
Anon	1995			IT 1252862 B	
Anon	1995			JP 7062212 B	
Anon	1996			JP 2034275 C	
Anon	1997			JP 2686755 B	

IT 254455-64-6
RL: TEM (Technical or engineered material use); USES (Uses)
(aluminum-coated hot-rolled and cold-rolled steel sheet with high strength and corrosion resistance)

RN 254455-64-6 CAPLUS

CN Iron alloy, base, Fe 95-99,Mn 0.5-3,Cr 0-1,C 0.2-0.5,Si 0.1-0.5,Ti 0-0.2,Al 0-0.1,B 0-0.1,P 0-0.1 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 99	7439-89-6
Mn	0.5 - 3	7439-96-5
Cr	0 - 1	7440-47-3
C	0.2 - 0.5	7440-44-0
Si	0.1 - 0.5	7440-21-3
Ti	0 - 0.2	7440-32-6
Al	0 - 0.1	7429-90-5

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    B       0   -   0.1      7440-42-8
    P       0   -   0.1      7723-14-0

IPCI C22C0038-32 [ICM,6]
IPCR C23C0002-12 [I]; C21D0008-02 [I]; C22C0038-00 [I]; C22C0038-32 [I];
     C22C0038-38 [I]; C23C0002-28 [I]; C23C0030-00 [I]
CC   55-3 (Ferrous Metals and Alloys)
ST   aluminum coated steel sheet
IT   Coating process
       (hot-dipping; of hot-rolled and cold-rolled steel sheet with
       aluminum alloy)
IT   110107-84-1, uses   254455-64-6
     RL: TEM (Technical or engineered material use); USES (Uses)
       (aluminum-coated hot-rolled and cold-rolled steel
       sheet with high strength and corrosion resistance)
IT   37296-00-7   254455-65-7
     RL: PEP (Physical, engineering or chemical process); PROC (Process)
       (coating of hot-rolled and cold-rolled steel sheet
       with)
OS.CITING REF COUNT:     16    THERE ARE 16 CAPLUS RECORDS THAT CITE THIS
                               RECORD (19 CITINGS)


L15  ANSWER 120 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        1999:474181  CAPLUS Full-text
DOCUMENT NUMBER:         131:274752
TITLE:                   Effect of electrode drying conditions and preheating
                         temperature on cold cracking in welded joints of
                         low-alloy high-resistance coated-electrode
                         electric-arc steels
AUTHOR(S):               da Silva, Paulo Guedes; Maciel, Theophilo Moura
CORPORATE SOURCE:        Centro de Ciencias e Tecnologia, Universidade Federal
                         da Paraiba - UFPb, Brazil
SOURCE:                  Congresso Anual - Associacao Brasileira de Metalurgia
                         e Materiais (1998), Volume Date 1997, 52nd(II
                         Congresso Internacional de Tecnologia Metalurgica e de
                         Materiais), 4358-4368
                         CODEN: CAAMEU
PUBLISHER:               Associacao Brasileira de Metalurgia e Materiais
DOCUMENT TYPE:           Journal; (computer optical disk)
LANGUAGE:                Portuguese
AB   The effects of the electrode moisture level and of the cooling rate on the
     cold cracking of welded joints of HSLA steels was evaluated.  The
     shielded metal arc Welding process was employed.  The weld deposits were
     made with AWS E 12018-G electrode, using the SAR 120 T (ASTM 514 B) as
     steel base metal.  The cooling rate was varied by varying the
     pre-heating temp. and the moisture level was varied by varying the
     electrode redried time.  The results obtained indicated a significative
     redn. on the cracks with the increase of the pre-heating temp. and with
     the increases of the redried times, without signification changes at the
     weld metal microstructure and hardness.  The absence of cracks was found
     for welds deposited with pre-heating above 180 °C and with
     electrodes redried for 2 h at 240 °C.
IT   52346-86-8, ASTM A514B, processes
     RL: PEP (Physical, engineering or chemical process); PRP (Properties);
     PROC (Process)
       (effect of electrode drying conditions and preheating temp. on cold
       cracking in welded joints of low-alloy steel using
       high-resistance coated-electrode elec.-arc welding fillers)
RN   52346-86-8  CAPLUS
CN   Steel, (UNS K11630)  (CA INDEX NAME)

Component        Component          Component
                  Percent         Registry Number
=========+=================+================
    Fe       97      -  98          7439-89-6
    Mn        0.70   -   1.00        7439-96-5
    Cr        0.40   -   0.65        7440-47-3
    Si        0.20   -   0.35        7440-21-3
    Mo        0.15   -   0.25        7439-98-7
    C         0.12   -   0.21        7440-44-0
    V         0.03   -   0.08        7440-62-2
```

S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
Ti	0.01	-	0.03	7440-32-6
B	0.0005	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST steel weld cracking electrode drying preheating
IT Drying
Humidity
(effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)
IT Welding of metals
(electrodes; effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)
IT Welding of metals
(shielded metal arc; effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)
IT 52346-86-8, ASTM A514B, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)
IT 12597-69-2, Steel, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(welded; effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)
IT 154804-42-9, AWS E12018G
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(welding electrode; effect of electrode drying conditions and preheating temp. on cold cracking in welded joints of low-alloy steel using high-resistance coated-electrode elec.-arc welding fillers)

L15 ANSWER 121 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1998:423487 CAPLUS Full-text
DOCUMENT NUMBER: 129:125249
ORIGINAL REFERENCE NO.: 129:25595a,25598a
TITLE: Effect of laser hardening on the fatigue strength and fracture of a B-Mn steel
AUTHOR(S): De La Cruz, Pedro; Oden, Magnus; Ericsson, Torsten
CORPORATE SOURCE: Division of Engineering Material, Department of Mechanical Engineering, Linkoping University, Linkoping, S-581 83, Swed.
SOURCE: International Journal of Fatigue (1998), 20(5), 389-398
CODEN: IJFADB; ISSN: 0142-1123
DIGITAL OBJECT ID: 10.1016/S0142-1123(98)00010-3
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The influence of laser hardening on plane bending fatigue behavior (R = -1) of a B-Mn SS2131 (~AISI 15B21H) steel has been studied. Laser hardening improves the fatigue limit of Q&T smooth and notched specimens by 18 and 56%. The fatigue strength improvement depends on the fatigue life. Surface and subsurface crack initiations occur independently of the applied load level. The residual stresses and hardness distributions caused by laser hardening generate improvement in the fatigue properties, however, the improvement is less than that seen for plasma nitriding on the same core material. The local fatigue strength approach predicts the existence of surface layers with good and bad fatigue properties. The detrimental factors that occur with laser hardening are the formation of soft surface layers and low compressive residual stresses at the overlapping zones. These factors produce a long narrow crack along the

edge of the overlapping zone causing premature failure. Comparison of fatigue data for different laser-hardened steels shows a trend towards an increased fatigue limit with increasing hardness and compressive residual stress.

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Bello, J	1994	29	5213	J Mater Sci	CAPLUS
Bergmann, H	1985	1	137	Surf Eng	
Buch, A	1988			Fatigue Strength Cal	
Dahotre, N	1985		101	Laser Processing of	CAPLUS
de La Cruz, P	1997	00	00	Mater Sci Eng A	
Doong, J	1989	33	483	Eng Fract Mech	
Dubrovskaya, E	1986	28	658	Metal Sci Heat Treat	
Ericsson, T	1985		702	4th Int Congress on	CAPLUS
Ericsson, T	1987		87	Advances in Surface	
Ericsson, T	1987		113	Fatigue and Stress o	
Freitas, M	1993	167	115	Mater Sci Eng A	
Frost, N	1974			Metal Fatigue	
Gnamuthu, D	1979		177	Applications of Lase	
Kato, A	1985	107	195	J Eng Mater Technol	
Kawasumi, H	1981		185	Source Book on Appli	
Kloos, K	1986		203	Residual Stresses	
Krauss, G	1990			Steels:Heat Treatmen	
Li, W	1986	34	1533	Acta Metall	CAPLUS
Li, W	1984			Doctoral thesis, Lul	
Li, W	1986	2	43	Surf Eng	
Lin, R	1992			Doctoral thesis, Lin	
Merrien, P	1992	8	61	Surf Eng	CAPLUS
Mitin, V	1989	30	769	Metal Sci Heat Treat	
Noyan, I	1987			Residual Stress	
Palombarini, G	1991	26	3396	Mater Sci	CAPLUS
Sholtes, B	1987		655	Residual Stresses in	
Shur, E	1982	24	341	Metal Sci Heat Treat	
Singh, H	1981	12A	138	Metall Trans A	
Solina, A	1984	3	193	J Heat Treat	CAPLUS
Steen, W	1979	6	456	Met Technol	CAPLUS
Sun, Y	1988		191	Int Power Beam Confe	
van Brussel, B	1993	161	83	Mater Sci Eng A	
Winderlich, B	1990	21	378	Materialwissenschaft	CAPLUS
Yijun, H	1994		600	Second International	

IT 204450-94-2, SS2131, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties);
PROC (Process)
(laser hardening effect on the fatigue strength and fracture of a B-Mn steel)

RN 204450-94-2 CAPLUS
CN Steel, (SIS 14 2131) (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	1.10 - 1.40	7439-96-5
Cr	0.30 - 0.60	7440-47-3
Si	0.15 - 0.40	7440-21-3
C	0.25 - 0.30	7440-44-0
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0.002	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST boron manganese steel laser hardening fatigue
IT Laser surface treatment
(hardening effect on the fatigue strength and fracture of a B-Mn steel)
IT Fatigue, mechanical
(laser hardening effect on the fatigue strength and fracture of a B-Mn steel)
IT 204450-94-2, SS2131, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties);

PROC (Process)
(laser hardening effect on the fatigue strength and fracture of a B-Mn steel)
OS.CITING REF COUNT: 26 THERE ARE 26 CAPLUS RECORDS THAT CITE THIS RECORD (26 CITINGS)

L15 ANSWER 122 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1998:169601 CAPLUS Full-text
DOCUMENT NUMBER: 128:219812
ORIGINAL REFERENCE NO.: 128:43509a,43512a
TITLE: Influence of hot dip galvanizing on fatigue and corrosion fatigue resistance of a B-Mn steel
AUTHOR(S): De la Cruz, Pedro; Ericsson, Torsten
CORPORATE SOURCE: Division Engineering Materials, Department Mechanical Engineering, Linkoeping University, Linkoeping, S-58183, Swed.
SOURCE: Scandinavian Journal of Metallurgy (1997), 26(4), 145-152
CODEN: SJMLAG; ISSN: 0371-0459
PUBLISHER: Munksgaard International Publishers Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The effects of hot dip galvanizing on fatigue and corrosion fatigue resistance of smooth and notched quenched and tempered (Q&T) specimens were investigated. Const. stress amplitude plane reversed bending fatigue tests (R = -1) at 47 Hz in air and seawater were conducted using cylindrical hot dip galvanized (HDG) and Q&T steel specimens made of a B-Mn steel, SS 2131 (~AISI 15B21H), with Kt = 1.05 and 1.7. The results are compared with those obtained for plasma-nitrided and laser-hardened specimens. The S-N curves show that hot dip galvanizing slightly decreases the air fatigue limit of smooth (~9%) and notched (~10%) specimens. In seawater, smooth and notched HDG specimens exhibit corrosion fatigue limits (at 2 × 107 cycles) with values a little lower than the corresponding air fatigue limits. The corrosion fatigue strength of HDG specimens is also superior to the fatigue strengths resulting from other surface treatments (plasma nitriding and laser hardening). The small cracks formed in the coating during galvanizing could be the cause of the slight decrease in air fatigue. Phys. and electrochem. corrosion protection by hot dip galvanizing are the causes for the good corrosion fatigue properties obtained.
IT 204450-94-2, SS 2131, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hot dip galvanizing effect on fatigue and corrosion fatigue resistance of B-Mn steel)
RN 204450-94-2 CAPLUS
CN Steel, (SIS 14 2131) (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	1.10 - 1.40	7439-96-5
Cr	0.30 - 0.60	7440-47-3
Si	0.15 - 0.40	7440-21-3
C	0.25 - 0.30	7440-44-0
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0.002	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST corrosion fatigue galvanized boron manganese steel; crack initiation galvanized boron manganese steel
IT Coating materials
(anticorrosive; influence of hot dip galvanizing on fatigue and corrosion fatigue resistance of B-Mn steel)
IT Corrosion fatigue
Seawater
(hot dip galvanizing effect on fatigue and corrosion fatigue resistance of B-Mn steel)
IT Galvanizing

(hot-dip; fatigue and corrosion fatigue resistance of B-Mn steel)
IT Crack initiation
(influence of hot dip galvanizing on fatigue and corrosion fatigue resistance of B-Mn steel)
IT 204450-94-2, SS 2131, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hot dip galvanizing effect on fatigue and corrosion fatigue resistance of B-Mn steel)
OS.CITING REF COUNT: 8 THERE ARE 8 CAPLUS RECORDS THAT CITE THIS RECORD (8 CITINGS)

L15 ANSWER 123 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1998:156999 CAPLUS Full-text
DOCUMENT NUMBER: 128:273318
ORIGINAL REFERENCE NO.: 128:54049a,54052a
TITLE: Influence of plasma nitriding on fatigue strength and fracture of a B-Mn steel
AUTHOR(S): De la Cruz, P.; Oden, M.; Ericsson, T.
CORPORATE SOURCE: Department of Mechanical Engineering, Division of Engineering Material, Linkoping University, Linkoping, S-581 83, Swed.
SOURCE: Materials Science & Engineering, A: Structural Materials: Properties, Microstructure and Processing (1998), A242(1-2), 181-194
CODEN: MSAPE3; ISSN: 0921-5093
DIGITAL OBJECT ID: 10.1016/S0921-5093(97)00518-2
PUBLISHER: Elsevier Science S.A.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The first part of a systematic investigation is presented of surface treatments affecting the fatigue behavior of smooth and notched quenched and tempered (Q&T) specimens made of a B-Mn SS2131 (≈AISI 15B21H) steel. In this part, the effects of plasma nitriding (nitriding temp.=480°C, time=24 h) on the fatigue strength and notch sensitivity were investigated. Const. stress amplitude plane reversed bending fatigue tests (R=-1) at 47 Hz were conducted using cylindrical plasma nitriding (PN) and Q&T steel specimens with Kt=1.05 and 1.7. The compd. layer was found to consists of .vepsiln.-phase and γ'-phase. S-N curves show that plasma nitriding improves the fatigue limit by 53 and 115% of Q&T smooth and notched specimens, resp. The fatigue strength of smooth specimens is improved through the whole fatigue life but only for long fatigue lives for notched specimens. Plasma nitriding reverses the low notch sensitivity (at short lives) and high notch sensitivity (at long lives) exhibited by Q&T specimens. It is shown that compressive stresses introduced by plasma nitriding play the principal role on improvement of fatigue strength, subsurface crack nucleation, fish-eye asymmetry, and redn. of stress intensity factors. Fracture toughness, evaluated as a function of depth from the surface, decreases rapidly when approaching the surface. A simple model based on crack retardation and redn. of stress intensity factors produced by the net stress distribution is used to explain fish-eye formation and subsurface fatigue failure.
RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1963			A Guide for Fatigue	
Anon	1992			Powder Diffraction F	
Barrallier, L	1994		498	Fourth Int Conferenc	
Bell, T	1983	83	1.1	Heat Treatment	
Bell, T	1987		13	International Semina	
Bell, T	1982	2	232	J Heat Treat	
Celik, A	1995	72	169	Surf Coat Technol	
Conway, J	1991			Analysis and Represe	
Daves, W	1992		957	European Conference	
Daves, W	1994		525	Fourth Int Conferenc	
Delhez, R	1987	3	331	Surf Eng	CAPLUS
Edenhofer, B	1974	1	56	Heat Treat Met	
Edenhofer, B	1976	76	7	Heat Treatment	

Edenhofer, B	1979	79	52	Heat Treatment	
Elber, W	1970	2	37	Eng Fract Mech	
Ericsson, T	1987	4	87	Advances in Surface	
Ericsson, T	1987		113	Fatigue and Stress o	
Ericsson, T	1985		7	Fatigue of surface h	
Fengzhao, L	1986		347	5th Int Congress on	
Hertzberg, R	1989			Deformation and Frac	
Hibbitt Karlsson & Sore	1993			Abaqus, User's Manua	
Hombeck, F	1991	7	45	Surf Eng	CAPLUS
Hudis, M	1973	44	1489	J Appl Phys	CAPLUS
Jones, C	1973	73	71	Heat Treatment	
Keller, K	1971	26	120	Mitt	CAPLUS
Kloos, K	1986		203	Residual Stresses	
Kreft, U	1992		115	European Conference	
Kreft, U	1992		123	European Conference	
Landgraf, R	1977			Fatigue-Fundamental	
Magnusson, L	1979	79	203	Heat Treatment	
Magnusson, L	1979			Linkoping University	
Mahboubi, F	1995	71	135	Surf Coat Technol	CAPLUS
Marciniak, A	1988	156	337	Thin Solid Films	
Michel, H	1995	72	103	Surf Coat Technol	CAPLUS
Mittemeijer, E	1983	3	114	J Heat Treating	
Molinari, A	1993	3	949	J de Physique IV	CAPLUS
Noyan, I	1987			Residual Stress	
Oettel, H	1994		1285	Fourth Int Conferenc	
Peterson, R	1955		293	Metal Fatigue	
Peterson, R	1953			Stress Concentration	
Quian, J	1995	17	15	Int J Fatigue	
Salkova, S	1987	28	554	Metal Sci Heat Treat	
Schreiber, G	1992		965	European Conference	
Seylbolt, A	1969	245	769	Met Prog	
Somers, M	1989			Delft University of	
Suresh, S	1991			Cambridge Solid Stat	
Tibbetts, G	1974	45	5072	J Appl Phys	CAPLUS
Troshchenko, V	1988	11	123	Fatigue Fract Engng	
Xu, K	1994	16	337	Int J Fatigue	CAPLUS

IT 204450-94-2, SS 2131, properties
RL: PRP (Properties)
(effect of plasma nitriding on fatigue strength and fracture of B-Mn steel)
RN 204450-94-2 CAPLUS
CN Steel, (SIS 14 2131) (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	1.10	-	1.40	7439-96-5
Cr	0.30	-	0.60	7440-47-3
Si	0.15	-	0.40	7440-21-3
C	0.25	-	0.30	7440-44-0
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
B		0.002		7440-42-8

CC 55-12 (Ferrous Metals and Alloys)
ST steel nitridation fatigue strength fracture
IT Fatigue, mechanical
Fracture (materials)
Plasma nitriding
Strength
(effect of plasma nitriding on fatigue strength and fracture of B-Mn steel)
IT Simulation and Modeling, physicochemical
(finite-element; effect of plasma nitriding on fatigue strength and fracture of B-Mn steel)
IT 204450-94-2, SS 2131, properties
RL: PRP (Properties)
(effect of plasma nitriding on fatigue strength and fracture of B-Mn steel)
OS.CITING REF COUNT: 13 THERE ARE 13 CAPLUS RECORDS THAT CITE THIS RECORD (13 CITINGS)

L15 ANSWER 124 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1997:607427 CAPLUS Full-text
DOCUMENT NUMBER: 127:296559
ORIGINAL REFERENCE NO.: 127:57923a,57926a
TITLE: Nondestructive testing of carburizing
AUTHOR(S): Bochenin, V. I.; Burnakov, K. K.
CORPORATE SOURCE: Kurgan. Gos. S-kh. Akad. im. Mal'tseva, Kurgan, Russia
SOURCE: Vestnik Mashinostroeniya (1997), (3), 31-33
CODEN: VMASAV; ISSN: 0042-4633
PUBLISHER: Mashinostroenie
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB A nondestructive testing technique is developed for the detn. of the depth of a carburized layer. It consists in γ-quantum narrow-beam examn. of a controlled medium material and detn. of the degree of photon absorption in different layers of the product surface, the C amt. being detected based on the γ-phase content. The results of exptl. testing conducted on three different steels showed a little discrepancy between the new technique and conventionally used chem. anal.
IT 37312-00-8, 20KhGNR
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(nondestructive testing of carburized layer depth in steel carburizing)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
Section cross-reference(s): 79
ST steel carburization carbon distribution nondestructive testing
IT Carburizing
(nondestructive testing of carburized layer depth in steel carburizing)
IT Testing of materials
(nondestructive; nondestructive testing of carburized layer depth in steel carburizing)
IT 12742-08-4, 20Kh2N4A 12742-21-1, 18Kh2N4VA 37312-00-8, 20KhGNR
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(nondestructive testing of carburized layer depth in steel carburizing)

L15 ANSWER 125 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1995:373624 CAPLUS Full-text
DOCUMENT NUMBER: 122:226275
ORIGINAL REFERENCE NO.: 122:41123a,41126a
TITLE: In search of the ultimate experiment for quantitative depth profile analysis in glow discharge optical

emission spectrometry. Part I: Calibration curves
AUTHOR(S): Payling, Richard; Jones, Delwyn G.; Gower, Stephen A.
CORPORATE SOURCE: Sheet & Coil Products Div., Res. & Technol. Centre, Port Kembla, NSW 2505, Australia
SOURCE: Surface and Interface Analysis (1995), 23(1), 1-11
CODEN: SIANDQ; ISSN: 0142-2421
DIGITAL OBJECT ID: 10.1002/sia.740230102
PUBLISHER: Wiley
DOCUMENT TYPE: Journal
LANGUAGE: English
AB This is the 1st part of the search for an expt. that will show definitively which is the best method for quant. glow discharge optical emission spectrometry (GDOES). Three empirical methods for producing quant. depth profiles from GDOES data were examd.: the SIMR method, the IRSID methods for producing quant. glow discharge optical emission spectrometry (GDOES). Three empirical methods for producing quant. depth profiles from GDOES data were examd.: the SIMR method, the IRSID method and the most recent BHP method. All three methods give worthwhile quant. depth profiles of thin films and coated materials. The 1st two methods assume that pressure does not have a significant effect on emission yield, while the 3rd method assumes that pressure is the only significant parameter affecting emission yield. The different approaches therefore imply very different phys. processes inside the lamp and it is essential for further development of quant. GDOES that the best approach be detd. Depth profiling in GDOES is, in principle, simply bulk anal. repeated over and over as a function of depth. The three methods are therefore tested here in their ability to do bulk calibration in a range of steels and Zn-Al alloy stds., all at const. current. All methods worked well for steel, while the best calibration curves in Zn-Al alloys were obtained with pressure-cor. IRSID and SIMR methods or a voltage-cor. BHP method. Probably emission yields depend on both voltage and pressure (and presumably current, which was not tested here in Part I).
IT 68467-45-8
RL: PRP (Properties)
(calibration for quant. depth profile anal. in glow discharge optical emission spectrometry for)
RN 68467-45-8 CAPLUS
CN Steel, (AISI 94B17) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.75	-	1.00	7439-96-5
Ni	0.30	-	0.60	7440-02-0
Cr	0.30	-	0.50	7440-47-3
Si	0.15	-	0.35	7440-21-3
C	0.15	-	0.20	7440-44-0
Mo	0.08	-	0.15	7439-98-7
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.003	7440-42-8

CC 73-12 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
IT Coating materials
Films
(calibration for quant. depth profile anal. in glow discharge optical emission spectrometry for)
IT 12631-59-3 68467-45-8 98525-36-1, properties 120599-23-7, properties 162030-91-3, properties 162030-92-4, properties 162030-93-5, properties 162030-94-6, properties 162030-95-7, properties 162030-96-8, properties 162030-97-9, properties 162030-98-0, properties 162030-99-1, properties 162031-01-8 162031-02-9 162031-03-0 162031-04-1 162031-05-2 162031-06-3 162031-07-4 162031-08-5 162031-11-0 162031-12-1 162063-60-7 162842-91-3
RL: PRP (Properties)
(calibration for quant. depth profile anal. in glow discharge optical emission spectrometry for)
OS.CITING REF COUNT: 13 THERE ARE 13 CAPLUS RECORDS THAT CITE THIS

RECORD (13 CITINGS)

L15 ANSWER 126 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1991:232667 CAPLUS Full-text
DOCUMENT NUMBER: 114:232667
ORIGINAL REFERENCE NO.: 114:39207a,39210a
TITLE: Behavior of high-strength structural steels exposed to seawater
AUTHOR(S): Pircher, Hans; Drodten, Peter; Kaiser, Hans Juergen; Muesgen, Bruno
CORPORATE SOURCE: Forsch., Zent. Qualitaetswesen Chem. Lab., Thyssen Stahl A.-G., Duisburg, 4100/11, Germany
SOURCE: Thyssen Technische Berichte (1990), 22(1), 53-67
CODEN: TBTHDV; ISSN: 0340-5060
DOCUMENT TYPE: Journal
LANGUAGE: English/German

AB Of the 3 high-strength structural steels which were tested in comparison with the FeE 355 grade, normally used for seawater-exposed structures, the water-quenched and tempered steel FeE 500V is outstandingly resistant. This statement also applies, with reservations, to the normalized steel FeE 460. Steel FeE 690V, because of a pronounced sensitivity in the heat-affected zone of its welds, is suited for use in coated marine structures only. A strong rise in the H permeation c.d. was found at pH <4. Stress-corrosion cracking in artificial and natural seawater and H pickup during slow strain and cathodic polarization are discussed.

IT 50947-32-5, FeE 500V, reactions 68035-28-9, FeE 690V
RL: RCT (Reactant); RACT (Reactant or reagent)
(marine structures from high-strength, behavior of, in seawater)

RN 50947-32-5 CAPLUS
CN Iron alloy, base, Fe 94-100,Mn 0-1.70,Cr 0-1.00,Ni 0-1.00,Si 0-0.80,Mo 0-0.60,C 0-0.20,V 0-0.10,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8909) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 100	7439-89-6
Mn	0 - 1.70	7439-96-5
Cr	0 - 1.00	7440-47-3
Ni	0 - 1.00	7440-02-0
Si	0 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
C	0 - 0.20	7440-44-0
V	0 - 0.10	7440-62-2
Nb	0 - 0.05	7440-03-1
P	0 - 0.025	7723-14-0
S	0 - 0.025	7704-34-9
B	0 - 0.005	7440-42-8

RN 68035-28-9 CAPLUS
CN Iron alloy, base, Fe 94-99,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.12,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8928) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	94 - 99	7439-89-6
Mn	0 - 1.70	7439-96-5
Ni	0 - 1.50	7440-02-0
Cr	0 - 1.00	7440-47-3
Si	0.15 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
Cu	0 - 0.50	7440-50-8
C	0 - 0.20	7440-44-0
V	0 - 0.12	7440-62-2
Nb	0 - 0.05	7440-03-1
P	0 - 0.025	7723-14-0
S	0 - 0.025	7704-34-9
B	0 - 0.005	7440-42-8

```
CC   55-10 (Ferrous Metals and Alloys)
     Section cross-reference(s): 51
ST   high strength steel seawater corrosion
IT   39334-59-3, Fe-E355, reactions   50947-32-5, FeE 500V, reactions
     55405-17-9, FeE 460, reactions   68035-28-9, FeE 690V
     RL: RCT (Reactant); RACT (Reactant or reagent)
        (marine structures from high-strength, behavior of, in seawater)
OS.CITING REF COUNT:     1     THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD
                               (1 CITINGS)


L15  ANSWER 127 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        1991:147980  CAPLUS Full-text
DOCUMENT NUMBER:         114:147980
ORIGINAL REFERENCE NO.:  114:25011a,25014a
TITLE:                   Laser coating of metal parts for wear resistance
INVENTOR(S):             Uelze, Andreas; Gassmann, Roland; Mueller, Peter
PATENT ASSIGNEE(S):      Hochschule fuer Verkehrswesen "Friedrich List", Ger.
                         Dem. Rep.
SOURCE:                  Ger. (East), 3 pp.
                         CODEN: GEXXA8
DOCUMENT TYPE:           Patent
LANGUAGE:                German
FAMILY ACC. NUM. COUNT:  1
PATENT INFORMATION:
     PATENT NO.          KIND  DATE        APPLICATION NO.          DATE
     ---------------     ----  --------    ---------------------    --------
     DD 273458            A1   19891115    DD 1988-317199           19880628
PRIORITY APPLN. INFO.:                    DD 1988-317199           19880628
PATENT STATUS PATENT INFORMATION:
     PATENT NO.          KIND  STATUS          STATUS DATE
     ---------------     ----  -------------   -----------
     DD 273458            A1   Dead            20201106
AB   Metals are laser coated with the martensitic Fe alloy contg. C 0.2-1.5,
     Si ≤1.5, Mn ≤1.0, Cr ≤20, Mo ≤20, V,Co
     ≤10 each, and B ≤2.5% to form spalling-resistant layers of
     high hardness and wear resistance.
IT   132986-13-1
     RL: USES (Uses)
        (martensitic, laser coating with, of steel)
RN   132986-13-1  CAPLUS
CN   Iron alloy, base, Fe 34-100,Cr 0-20,Mo 0-20,Co 0-10,V 0-10,B 0-2.5,C
     0.2-1.5,Si 0-1.5,Mn 0-1 (9CI)  (CA INDEX NAME)

Component   Component      Component
             Percent    Registry Number
==========+============+================
    Fe      34   - 100       7439-89-6
    Cr       0   -  20       7440-47-3
    Mo       0   -  20       7439-98-7
    Co       0   -  10       7440-48-4
    V        0   -  10       7440-62-2
    B        0   -   2.5     7440-42-8
    C        0.2 -   1.5     7440-44-0
    Si       0   -   1.5     7440-21-3
    Mn       0   -   1       7439-96-5

IPCI C23C0030-00 [ICM,4]; C23C0024-10 [ICS,4]; B22F0007-04 [ICS,4]
IPCR B22F0007-04 [I]; C23C0024-10 [I]; C23C0030-00 [I]
CC   55-6 (Ferrous Metals and Alloys)
ST   martensite iron alloy laser coating; steel laser coating martensite alloy
IT   Shafts
        (cam-, laser coating of, with martensitic iron alloy)
IT   Coating process
        (laser-induced, with martensitic iron alloy, of metals)
IT   132986-11-9, Carbon 0.5, iron 97, manganese 1.6, molybdenum 0.1, silicon
     0.9, vanadium 0.3, uses and miscellaneous   132986-12-0, Boron 1.5, carbon
     1, chromium 18, iron 61, silicon 0.9, tungsten 18   132986-13-1
     RL: USES (Uses)
        (martensitic, laser coating with, of steel)
```

L15 ANSWER 128 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1991:147833 CAPLUS Full-text
DOCUMENT NUMBER: 114:147833
ORIGINAL REFERENCE NO.: 114:24995a,24998a
TITLE: Development of technology for electrospark hardening of steel steam turbine parts
AUTHOR(S): Skoblo, T. S.; Sidenko, V. N.; Tripolko, V. K.; Rudyuk, A. S.
CORPORATE SOURCE: USSR
SOURCE: Tyazheloe Mashinostroenie (1990), (7), 25-6
CODEN: TYMAEZ; ISSN: 1024-7106
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The valves of steam turbine distributor made from 20Kh1M1F1TR were hardened by electrospark treatment using electrodes from 40Kh13, 1Kh18N10T, and KhN77TYuR. The max. increase of wear resistance was obtained for 1Kh18N10T electrode: the wear resistance increases 1.8-fold compared with that of nitrided parts. After holding in air at 540° for 1000 h, no corrosion was obsd. at the hardened surface; the hardness and depth of the layer were unaffected by the holding.
IT 37311-91-4, 20Kh1M1F1TR
RL: USES (Uses)
(steam turbine parts from, electrospark hardening of)
RN 37311-91-4 CAPLUS
CN Iron alloy, base, Fe 95-98,Cr 0.90-1.40,Mo 0.80-1.10,V 0.70-1.00,Mn 0-0.50,Si 0-0.37,Cu 0-0.30,Ni 0-0.30,C 0.17-0.24,Ti 0.05-0.12,P 0-0.030,S 0-0.030,B 0.005 (20Kh1M1F1TR) (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Cr	0.90	-	1.40	7440-47-3
Mo	0.80	-	1.10	7439-98-7
V	0.70	-	1.00	7440-62-2
Mn	0	-	0.50	7439-96-5
Si	0	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
C	0.17	-	0.24	7440-44-0
Ti	0.05	-	0.12	7440-32-6
P	0	-	0.030	7723-14-0
S	0	-	0.030	7704-34-9
B	0.005			7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
Section cross-reference(s): 47
ST electrospark hardening steel steam turbine; electrode electrospark hardening steel turbine
IT Electric spark
(hardening by, of high-temp. steel parts for steam turbines)
IT Turbines
(steam, parts, from pearlitic high-temp. steel, electrospark hardening of, electrodes for)
IT 12719-18-5, KhN77TYuR 39412-98-1, 40Kh13 54611-20-0, 1Kh18N10T
RL: USES (Uses)
(electrode, for electrospark hardening of steam turbine parts from pearlitic high-temp. steel)
IT 37311-91-4, 20Kh1M1F1TR
RL: USES (Uses)
(steam turbine parts from, electrospark hardening of)

L15 ANSWER 129 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1990:518966 CAPLUS Full-text
DOCUMENT NUMBER: 113:118966
ORIGINAL REFERENCE NO.: 113:20121a,20124a
TITLE: Role of thermally hardened layers obtained by laser treatment in the wear resistance of contact pairs during fretting corrosion
AUTHOR(S): Dorozhkin, N. N.; Dubnyakov, V. N.; Kukin, S. F.; Pasakh, E. V.

CORPORATE SOURCE: PO Minsk. Trakt. Zavod, Minsk, USSR
SOURCE: Trenie i Iznos (1990), 11(2), 264-9
CODEN: TRIZD6; ISSN: 0202-4977
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Fretting corrosion tests of steel 20KhNP and cast iron SCh20 after laser hardening showed that the wear intensity of the metastable surface structure of the steel is 1/5th and that of the gray iron is 1/3rd of the values obtained for nonhardened materials. Surface deformation during the frictional interaction facilitates phase transformation in the metastable structure ensuring an increase in ductility at high values of hardness, which results in an increase in the wear resistance of the laser-hardened steel and cast iron during fretting corrosion.
IT 12742-15-3
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(laser hardening of, fretting corrosion in relation to)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-10 (Ferrous Metals and Alloys)
ST laser hardening steel fretting corrosion; cast iron laser hardening corrosion
IT 12742-15-3 72645-39-7, SCh20
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(laser hardening of, fretting corrosion in relation to)

L15 ANSWER 130 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1987:518988 CAPLUS Full-text
DOCUMENT NUMBER: 107:118988
ORIGINAL REFERENCE NO.: 107:19231a,19234a
TITLE: Gas-shielded metal-arc narrow-gap welding of high strength structural steels
AUTHOR(S): Groeger, Peter; Heuser, Albert; Eichhorn, Friedrich; Dahl, Winfried
CORPORATE SOURCE: ISF, RWTH Aachen, Aachen, Fed. Rep. Ger.
SOURCE: Stahl und Eisen (1987), 107(8), 377-84
CODEN: STEIA3; ISSN: 0340-479X
DOCUMENT TYPE: Journal
LANGUAGE: German
AB The mech. properties, such as strength, impact toughness, and brittleness transition temp. of fracture of welds in normalized or quenched-and-tempered fine-grain high strength steel plates (40 mm thick) were studied. The normalized St 460 and heat-treated StE 470 and 690 steels were 2-wire tandem welded by metal-inert gas narrow-gap process using SG3NiMo1 and SG2 wires. The brittleness transition temp. of the heat-affected zone was not affected by the layer structure of the multipass weld, whereas the fracture toughness was decreased by weld porosity.
IT 68411-33-0, UNS K11646
RL: TEM (Technical or engineered material use); USES (Uses)
(welding of quenched and tempered high-strength, metal-inert gas

narrow-gap)
RN 88411-33-0 CAPLUS
CN Iron alloy, base, Fe 96-98,Mn 0.87-1.41,Ni 0.27-0.73,Cr 0.36-0.69,Si 0.13-0.37,Mo 0.17-0.33,C 0.10-0.23,V 0.02-0.09,S 0-0.040,P 0-0.035,B 0.0005 (UNS K11646) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	96 - 98	7439-89-6
Mn	0.87 - 1.41	7439-96-5
Ni	0.27 - 0.73	7440-02-0
Cr	0.36 - 0.69	7440-47-3
Si	0.13 - 0.37	7440-21-3
Mo	0.17 - 0.33	7439-98-7
C	0.10 - 0.23	7440-44-0
V	0.02 - 0.09	7440-62-2
S	0 - 0.040	7704-34-9
P	0 - 0.035	7723-14-0
B	0.0005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST welding high strength steel property
IT Welding
(gas metal-arc, narrow-gap, of steels, high-strength structure in relation to)
IT 88411-33-0, UNS K11646
RL: TEM (Technical or engineered material use); USES (Uses)
(welding of quenched and tempered high-strength, metal-inert gas narrow-gap)
IT 73830-57-6, DIN 1.5130 110240-73-8, SG3NiMo1 110414-13-6
RL: TEM (Technical or engineered material use); USES (Uses)
(welding with, of high-strength steels, metal-inert gas narrow-gap)

L15 ANSWER 131 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1987:71034 CAPLUS Full-text
DOCUMENT NUMBER: 106:71034
ORIGINAL REFERENCE NO.: 106:11649a,11652a
TITLE: A nondestructive measurement of residual bulk stresses in welded steel specimens by use of magnetically induced velocity changes for ultrasonic waves
AUTHOR(S): Kwun, Hegeon
CORPORATE SOURCE: Nondestr. Eval. Sci. Technol. Div., Southwest Res. Inst., San Antonio, TX, USA
SOURCE: Materials Evaluation (1986), 44(13), 1560-6
CODEN: MAEVAD; ISSN: 0025-5327
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The distributions of residual bulk stresses in butt-welded ASTM A-588 [63849-06-9] steel and a T-shaped full-penetration-welded ASTM A514 [63747-69-3] steel were nondestructively measured by use of magnetically induced velocity changes (MIVC) for longitudinal and shear waves. The stress effects on MIVC obsd. under various uniaxial stress conditions were used to det. the residual bulk stresses. The results agree with stress values detd. by a layer-removal technique. The MIVC method may be developed to measure biaxial and triaxial stress states.
IT 52346-86-8, properties
RL: PRP (Properties)
(residual stresses in welded, detn. by magnetically induced velocity changes for ultrasonic waves)
RN 52346-86-8 CAPLUS
CN Steel, (UNS K11630) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.70 - 1.00	7439-96-5
Cr	0.40 - 0.65	7440-47-3
Si	0.20 - 0.35	7440-21-3

Mo	0.15	-	0.25	7439-98-7
C	0.12	-	0.21	7440-44-0
V	0.03	-	0.08	7440-62-2
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
Ti	0.01	-	0.03	7440-32-6
B	0.0005	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
IT Welds
(steel, residual bulk stresses in, detn. by magnetically induced velocity changes for ultrasonic waves)
IT 52346-86-8, properties 61299-90-9, properties
RL: PRP (Properties)
(residual stresses in welded, detn. by magnetically induced velocity changes for ultrasonic waves)
IT 12597-69-2
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(welds, steel, residual bulk stresses in, detn. by magnetically induced velocity changes for ultrasonic waves)
OS.CITING REF COUNT: 1 THERE ARE 1 CAPLUS RECORDS THAT CITE THIS RECORD (1 CITINGS)

L15 ANSWER 132 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1986:537713 CAPLUS Full-text
DOCUMENT NUMBER: 105:137713
ORIGINAL REFERENCE NO.: 105:22175a,22178a
TITLE: Consumables for [welding] higher-strength steels
AUTHOR(S): Mumford, J. C.; McKeown, D.
CORPORATE SOURCE: R and D Dep., ESAB, UK
SOURCE: Metal Construction (1986), 18(6), 373-6
CODEN: MECODD; ISSN: 0307-7896
DOCUMENT TYPE: Journal
LANGUAGE: English
AB A metal-cored wire of Coromig 2.5Ni and a low-H coated electrode of Hitrex 10016G were developed to match the stringent requirements for strength and low-temp. toughness in welds of high-strength steels, such as BS 4360-50D, BS 5135, HY 80, HT 80, etc. The compn. and structure of welds formed in high-strength steels with the use of developed consumables are discussed.
IT 12604-89-6, uses and miscellaneous
RL: USES (Uses)
(welding of high-strength, consumables for, weld metal structure and properties in relation to)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST welding consumable high strength steel; metal cored wire steel welding; electrode coated steel weld strength
IT Welding
(of high-strength steel, consumables for, weld metal structure and properties in relation to)
IT Welding
(electrodes, for high-strength steel, weld metal structure and properties in relation to)
IT 12604-89-6, uses and miscellaneous 39419-10-8, uses and

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     miscellaneous   54824-12-3   62199-99-9, uses and miscellaneous
     104364-16-1, uses and miscellaneous
     RL: USES (Uses)
        (welding of high-strength, consumables for, weld metal structure and
        properties in relation to)
IT   86016-78-6   104364-17-2
     RL: USES (Uses)
        (welding with, of high-strength steel, weld metal structure
        and properties in relation to)


L15  ANSWER 133 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        1986:427896  CAPLUS Full-text
DOCUMENT NUMBER:         105:27896
ORIGINAL REFERENCE NO.:  105:4631a,4634a
TITLE:                   Corrosion fatigue of hot-dip galvanized welded joints
                         with permanent and alternate immersion
AUTHOR(S):               Olivier, Rainer
CORPORATE SOURCE:        Fraunhofer-Inst. Betriebsfestigkeit, Darmstadt,
                         6100/12, Fed. Rep. Ger.
SOURCE:                  Werkstoffe und Korrosion (1986), 37(4), 169-75
                         CODEN: WSKRAT; ISSN: 0043-2822
DOCUMENT TYPE:           Journal
LANGUAGE:                German
AB   Alternating stress corrosion fatigue of hot-dip galvanized fillet welds of
     steel plates Fe 360  [37222-92-7], Fe E 355  [39334-59-3], and Fe E 690
     [69683-64-3] was studied by permanent immersion in artificial seawater
     or alternate immersion in 5% NaCl.  The protective Zn coating increased
     the service life, as compared to nongalvanized plates, due to sepn. of the
     surface from the corrosive media and the cathodic corrosion prevention by
     Zn, based on the rest potential of -1150 mV (SCE) for galvanized and -650
     for bare steel.
IT   69683-64-3
     RL: RCT (Reactant); RACT (Reactant or reagent)
        (corrosion fatigue of galvanized welded)
RN   69683-64-3  CAPLUS
CN   Iron alloy, base, Fe 96-98,Mn 0.80-1.10,Cr 0.50-0.90,Si 0.50-0.90,Mo
     0.40-0.60,C 0.15-0.21,Zr 0.05-0.15,S 0-0.040,P 0-0.035,B 0-0.0025 (UNS
     K11872) (9CI)  (CA INDEX NAME)

Component        Component           Component
                  Percent          Registry Number
=========+=======================+===============
    Fe          96     -  98            7439-89-6
    Mn           0.80 -   1.10          7439-96-5
    Cr           0.50 -   0.90          7440-47-3
    Si           0.50 -   0.90          7440-21-3
    Mo           0.40 -   0.60          7439-98-7
    C            0.15 -   0.21          7440-44-0
    Zr           0.05 -   0.15          7440-67-7
    P            0    -   0.035         7723-14-0
    S            0    -   0.004         7704-34-9
    B            0    -   0.0025        7440-42-8

CC   55-10 (Ferrous Metals and Alloys)
ST   corrosion fatigue steel weld galvanized
IT   Galvanized iron and steel
     RL: USES (Uses)
        (corrosion fatigue of welded)
IT   Welds
        (steel, corrosion fatigue of galvanized)
IT   37222-92-7, reactions   39334-59-3, reactions   69683-64-3
     RL: RCT (Reactant); RACT (Reactant or reagent)
        (corrosion fatigue of galvanized welded)


L15  ANSWER 134 OF 168  CAPLUS  COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER:        1986:190490  CAPLUS Full-text
DOCUMENT NUMBER:         104:190490
ORIGINAL REFERENCE NO.:  104:30111a,30114a
TITLE:                   Structure and properties of a boronized layer of
                         carbon and low-alloy steels from high-frequency
```

current heating
AUTHOR(S): Zozulya, V. F.; Pavlyuchenko, A. A.; Legeida, V. N.
CORPORATE SOURCE: USSR
SOURCE: Vestn. Khar'k. Politekhn. In-ta (1985), (255), 42-4
From: Ref. Zh., Metall. 1986, Abstr. No. 2E285
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Title only translated.
IT 37311-91-4
RL: PRP (Properties)
(structure of boronized layer in, high-frequency heating in relation to)
RN 37311-91-4 CAPLUS
CN Iron alloy, base, Fe 95-98,Cr 0.90-1.40,Mo 0.80-1.10,V 0.70-1.00,Mn 0-0.50,Si 0-0.37,Cu 0-0.30,Ni 0-0.30,C 0.17-0.24,Ti 0.05-0.12,P 0-0.030,S 0-0.030,B 0.005 (20Kh1M1F1TR) (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Cr	0.90	-	1.40	7440-47-3
Mo	0.80	-	1.10	7439-98-7
V	0.70	-	1.00	7440-62-2
Mn	0	-	0.50	7439-96-5
Si	0	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
C	0.17	-	0.24	7440-44-0
Ti	0.05	-	0.12	7440-32-6
P	0	-	0.030	7723-14-0
S	0	-	0.030	7704-34-9
B	0.005			7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST steel boronized layer structure; heating high frequency boronizing steel
IT Boronizing
(of steel, carbon- and low-alloy, high-frequency heating effect on diffusion layer structure in)
IT 12651-65-9, properties 12725-36-9, properties 37311-91-4
RL: PRP (Properties)
(structure of boronized layer in, high-frequency heating in relation to)

L15 ANSWER 135 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1986:190442 CAPLUS Full-text
DOCUMENT NUMBER: 104:190442
ORIGINAL REFERENCE NO.: 104:30103a,30106a
TITLE: Soft layer in case-hardened steel gears
AUTHOR(S): Colombo, R. L.; Fusani, F.; Lamberto, M.
CORPORATE SOURCE: Iveco Eng., Turin, Italy
SOURCE: Trattamenti Termici (1984), (1), 3-6
Published in: Metall. Ital, 76(1)
CODEN: TRTEEX
DOCUMENT TYPE: Journal
LANGUAGE: Italian
AB The soft surface layer in case-hardened steel gears of low-alloy steels 21NiCrMo5 (contg. C 0.20, Mn 0.78, Si 0.28, Ni 1.35, Cr 0.9, Mo 0.21, and Al 0.04) [102068-62-2] or 94B17 (contg. C 0.17, Mn 0.86, Si 0.27, Ni 0.59, Cr 0.40, Mo 0.10, Al 0.054, and B 0.0020%) [68467-45-8] is due to incomplete martensitic transformation and to lower C content in the surface layer. The treatment of gears in the Holcroft continuous furnace comprised preheating and carburizing 8 h at 930°, diffusion holding at 900 for 4 h and oil hardening at 840° for 4 h. Steel surface covered with a Ni plate during carburizing, had an increased ferrite content in the surface layer, indicating the partial decarburization (or oxidn.). The C content in various depths of the case-hardened 94B17 gears detd. by a laser microprobe is 0.53 at 0.01, 0.95 at 0.1 mm, and 0.83% at 0.2 mm, whereas the content of other elements does not change with the distance from surface. Thus, along with carburizing of steel a slow oxidn. of some alloying elements occurred by

components of the furnace atm. (CO_2, H_2O) penetrating along the austenite grain boundaries. The oxides formed are not reduced by the carburizing atm. but can aid in the dissocn. of C from Fe carbide resulting in the decrease of C content in surface layer.

IT 68467-45-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(case-hardening of gears from, by carburization, soft layer formation in)

RN 68467-45-8 CAPLUS

CN Steel, (AISI 94B17) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.75	-	1.00	7439-96-5
Ni	0.30	-	0.60	7440-02-0
Cr	0.30	-	0.50	7440-47-3
Si	0.15	-	0.35	7440-21-3
C	0.15	-	0.20	7440-44-0
Mo	0.08	-	0.15	7439-98-7
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.003	7440-42-8

CC 55-5 (Ferrous Metals and Alloys)

ST transformation carburizing gear steel case hardening

IT Oxidation
(in gas carburization of steel gears, soft layer formation by)

IT Gears
(steels for, case-carburization of, soft layer formation in)

IT Carburizing
(gas, of steel gears, for case-hardening, soft layer formation in)

IT 68467-45-8, reactions 102068-62-2
RL: RCT (Reactant); RACT (Reactant or reagent)
(case-hardening of gears from, by carburization, soft layer formation in)

L15 ANSWER 136 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 1986:113747 CAPLUS Full-text

DOCUMENT NUMBER: 104:113747

ORIGINAL REFERENCE NO.: 104:17971a,17974a

TITLE: Cavitation-resistant diffusion layers on low-alloy steels

AUTHOR(S): Abacharaev, M. M.

CORPORATE SOURCE: Dagest. Politekh. Inst., Makhachkala, USSR

SOURCE: Zashchitnye Pokrytiya na Metallakh (1985), 19, 15-18
CODEN: ZPMEAC; ISSN: 0514-5864

DOCUMENT TYPE: Journal

LANGUAGE: Russian

AB A new criterion was developed for evaluation of the cavitation resistance of diffusion-coated low-alloy steels. The criterion was used in detn. of the cavitation resistance of quenched, Ti- and Mn-cemented, chromized, or chromized and cemented steels 20KhNR [12742-15-3], 40KhN [12742-05-1], and 38Kh2MYuA [12604-95-4]. The exptl. study and an anal. evaluation of steel cavitation resistance showed good coincidence using the criterion. The highest range of cavitation resistance was recorded for Cr + Mn-satd. steel 40KhN, Cr + Ti-satd. steel 20KhNR, and chromized steel 38Kh2MYuA.

IT 12742-15-3
RL: USES (Uses)
(cavitation-resistance of diffusion-satd., criterion for evaluation of)

RN 12742-15-3 CAPLUS

CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component	Component

	Percent			Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST steel diffusion coating cavitation resistance; criterion steel cavitation resistance evaluation; chromizing steel cavitation resistance; manganese cementation steel cavitation resistance; titanium cementation steel cavitation resistance
IT Chromizing
(of low-alloy steel, cavitation resistance by, criterion for evaluation of)
IT Cavitation
(resistance of low-alloy diffusion-satd. steel to, criterion for evaluation of)
IT 12604-95-4 12742-05-1 12742-15-3
RL: USES (Uses)
(cavitation-resistance of diffusion-satd., criterion for evaluation of)
IT 7439-96-5, reactions 7440-32-6, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(cementation of low-alloyed steels with, cavitation resistance by, criterion for evaluation of)

L15 ANSWER 137 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1985:581691 CAPLUS Full-text
DOCUMENT NUMBER: 103:181691
ORIGINAL REFERENCE NO.: 103:29223a,29226a
TITLE: Study of a dark constituent in carbonitridation layers
AUTHOR(S): Shapochkin, V. I.; Semenova, L. M.
CORPORATE SOURCE: VPO "VNIITMASh", Volgograd, USSR
SOURCE: Izvestiya Vysshikh Uchebnykh Zavedenii, Chernaya Metallurgiya (1985), (5), 125-9
CODEN: IVUMAX; ISSN: 0368-0797
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Low-alloy steels such as 20Kh [37329-39-8], 40Kh [39344-94-0], 25KhGT [12741-98-9], 25KhGM [51433-85-3], etc., were carbonitrided to 0.9-1.1% C and 0.4-0.5% N content in a 0.05 mm-deep layer. A dark constituent of the carbonitrided layer was studied by metallog., electron microscopy, and physicochem. anal. Pptn. of irregular-shaped inclusions surrounded by an easily etched zone, which usually crumbles during specimen prepn., was related to formation of the dark constituent.
IT 12742-15-3 37312-00-8 56995-50-7, reactions
RL: USES (Uses)
(carbonitriding of, defect structure formation in)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5

	Si	0.17	- 0.37	7440-21-3
	Cu	0	- 0.30	7440-50-8
	C	0.16	- 0.23	7440-44-0
	W	0	- 0.20	7440-33-7
	Mo	0	- 0.15	7439-98-7
	V	0	- 0.05	7440-62-2
	P	0	- 0.035	7723-14-0
	S	0	- 0.035	7704-34-9
	Ti	0	- 0.03	7440-32-6
	B		0.001	7440-42-8

RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B			0.001	7440-42-8

RN 56995-50-7 CAPLUS
CN Iron alloy, base, Fe 96-98,Cr 0.75-1.05,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,Ni 0-0.30,C 0.18-0.24,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	96	-	98	7439-89-6
Cr	0.75	-	1.05	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
C	0.18	-	0.24	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B			0.001	7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST steel carbonitriding defect structure ppt
IT Carbonitridation and Cyanidation
(of low-alloy steels, defect structure formation in)
IT 12681-03-7 12741-98-9, reactions 12742-08-4 12742-15-3
37312-00-8 37329-39-8, reactions 39344-94-0, reactions
51433-85-3, reactions 56995-50-7, reactions 66772-46-1
92049-05-3
RL: USES (Uses)
(carbonitriding of, defect structure formation in)

L15 ANSWER 138 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1984:495400 CAPLUS Full-text
DOCUMENT NUMBER: 101:95400

ORIGINAL REFERENCE NO.: 101:14571a,14574a
TITLE: Thermochemical treatment of steel parts in continuous furnaces with automatic control of carbon potential
AUTHOR(S): Kirnos, I. V.; Klyshnikov, S. T.; Kukui, B. G.; Lobachev, I. A.; Pegisheva, S. A.; Radzievskii, B. V.
CORPORATE SOURCE: VNIITMASh, USSR
SOURCE: Metallovedenie i Termicheskaya Obrabotka Metallov (1984), (4), 24-8
CODEN: MTOMAX; ISSN: 0026-0819
DOCUMENT TYPE: Journal
LANGUAGE: Russian

AB A continuous furnace for steel carburization was developed. A math. model was used for automatic control of the carburization process by monitoring the C potential and moisture content of the furnace atm. Tests were made on steels 20KhNR [12742-15-3] and 25KhGT [12741-98-9]. Good agreement of calcd. and exptl. data for C distribution in the hardened layers, related to process parameters, was obtained.

IT 12742-15-3
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in continuous furnace, control of, model for)

RN 12742-15-3 CAPLUS

CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-7 (Ferrous Metals and Alloys)

ST steel carburization continuous furnace control; model steel carburization furnace control

IT Furnaces
(continuous, for steel carburization, control of, model for)

IT Controlled atmospheres
(in continuous furnace for steel carburization)

IT Process simulation, physicochemical
(of carburization of steel in continuous process)

IT Carburizing
(of steel, in continuous furnace, control of, model for)

IT 12741-98-9, reactions 12742-15-3
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in continuous furnace, control of, model for)

L15 ANSWER 139 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1984:495398 CAPLUS Full-text
DOCUMENT NUMBER: 101:95398
ORIGINAL REFERENCE NO.: 101:14570h,14571a
TITLE: Thermocyclic carbonitridation of gears
AUTHOR(S): Bashnin, Yu. A.; Semenova, L. M.; Burenkova, O. S.; Borodova, I. A.; Ban'kovskii, A. I.
CORPORATE SOURCE: VNIITMASh, USSR
SOURCE: Metallovedenie i Termicheskaya Obrabotka Metallov (1984), (4), 14-15, 1 plate
CODEN: MTOMAX; ISSN: 0026-0819
DOCUMENT TYPE: Journal

LANGUAGE: Russian

AB Tractor gears were made from steels 25KhGT [12741-98-9] and 20KhGNR [37312-00-8], and carbonitrided in a furnace with endothermic atm. using thermocycling (heating to 880° and cooling in controlled amt.). The effect of the thermocycling on contact-fatigue strength of hardened gears was studied in comparison with conventional thermochem. treatments (isothermal carbonitridation or carburization). It was found that thermocycle-treated steels had the same amt. of C and N in hardened layers, but had lower amt. of residual austenite, smaller martensite needles, and finer carbonitride particles. Durability of thermocycle-treated gears was 2.5 times that of conventionally treated ones.

IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation of, for tractor wear, thermocycling in, structure and mech. properties and wear resistance in relation to)

RN 37312-00-8 CAPLUS

CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-7 (Ferrous Metals and Alloys)

IT Carbonitridation and Cyanidation
(of steel, for tractor gears, thermocycling in, structure and mech. properties and wear resistance in relation to)

IT Tractors
(steel parts for, carbonitridation of, thermocycling in, structure and mech. properties and wear resistance in relation to)

IT Gears
(steel, for tractors, carbonitridation of, thermocycling in, structure and mech. properties and wear resistance in relation to)

IT 12741-98-9, reactions 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation of, for tractor wear, thermocycling in, structure and mech. properties and wear resistance in relation to)

L15 ANSWER 140 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 1984:72033 CAPLUS Full-text

DOCUMENT NUMBER: 100:72033

ORIGINAL REFERENCE NO.: 100:10941a,10944a

TITLE: On the soft layer in carburized gears

AUTHOR(S): Colombo, R. L.; Fusani, F.; Lamberto, M.

CORPORATE SOURCE: IVECO Eng., Turin, 10156, Italy

SOURCE: Journal of Heat Treating (1983), 3(2), 126-8
CODEN: JHTRDR; ISSN: 0190-9177

DIGITAL OBJECT ID: 10.1007/BF02833083

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A frequently obsd. feature in gear carburizing is the formation on the part surface of a shallow layer showing traces of grain-boundary oxidn. This layer and that immediately underlying it often do not transform completely to martensite upon quenching, do not attain full hardness, and adversely affect the fatigue behavior of the gear. The occurrence of this

so-called soft layer is mostly assocd. with the depletion of the steel matrix in substitutional alloy elements. The main contribution to the hardenability loss is due instead to decarburization and a tentative explanation of the phenomenon is offered.

IT 68467-45-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(case carburization of gear, grain-boundary oxidn.-induced soft rear end)

RN 68467-45-8 CAPLUS
CN Steel, (AISI 94B17) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.75	-	1.00	7439-96-5
Ni	0.30	-	0.60	7440-02-0
Cr	0.30	-	0.50	7440-47-3
Si	0.15	-	0.35	7440-21-3
C	0.15	-	0.20	7440-44-0
Mo	0.08	-	0.15	7439-98-7
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.003	7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST case carburizing steel gear
IT Oxidation
(grain-boundary, of steel gears in gas carburization, soft rear formation by)
IT Gears
(steel, case carburization of, soft rear end)
IT Carburizing
(gas, of steel gears, soft rear end)
IT 12597-69-2, reactions 68467-45-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(case carburization of gear, grain-boundary oxidn.-induced soft rear end)
OS.CITING REF COUNT: 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

L15 ANSWER 141 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1983:526476 CAPLUS Full-text
DOCUMENT NUMBER: 99:126476
ORIGINAL REFERENCE NO.: 99:19427a,19430a
TITLE: Types of bainite in carburized layers of gears, hardness and effective thickness of layers containing bainite
AUTHOR(S): Susin, A. A.; Aleksandrov, B. I.; Val'ko, A. L.
CORPORATE SOURCE: USSR
SOURCE: Poverkh. Metody Uprochneniya Met. i Splavov v Mashinostr. Materialy Seminara, M. (1983) 32-6
From: Ref. Zh., Metall. 1983, Abstr. No. 8I1029
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Title only translated.
IT 12742-15-3
RL: USES (Uses)
(case carburization of gear, bainite morphol. in)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5

Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST carburizing gear steel bainite
IT Carburizing
(of steel gears, for case hardening, bainite morphol. in)
IT Gears
(steel, case carburization of, bainite morphol. in)
IT 12742-15-3
RL: USES (Uses)
(case carburization of gear, bainite morphol. in)
IT 12427-23-5
RL: PRP (Properties)
(morphol. of, in case-carburized steel gears)

L15 ANSWER 142 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1983:408990 CAPLUS Full-text
DOCUMENT NUMBER: 99:8990
ORIGINAL REFERENCE NO.: 99:1493a,1496a
TITLE: Ion nitriding behavior of several low alloy steels
AUTHOR(S): Robino, C. V.; Inal, O. T.
CORPORATE SOURCE: Dep. Metall. Mater. Eng., New Mexico Inst. Min. Technol., Socorro, NM, 87801, USA
SOURCE: Materials Science and Engineering (1983), 59(1), 79-90
CODEN: MSCEAA; ISSN: 0025-5416
DIGITAL OBJECT ID: 10.1016/0025-5416(83)90090-3
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The ion nitriding of several low-alloy steels, U.S. Steel T1 type A [52346-86-8], AISI 4140 [12672-16-1], AISI 6150 [39370-53-1], and Nitralloy 135M [61333-12-8], was examd. under varying process conditions using microhardness-depth correlations, friction and wear measurements, and optical and transmission electron microscopy. The process variables included time (2-4 h) and temp. (400-600°). All 4 steels exhibited a diffusion layer case growth rate which was dependent on the square root of the exposure time. The highest nitrided hardnesses and lowest case depths were obsd. in the Nitralloy 135M steel while the lowest hardnesses and highest case depths in the T1 steel. The behaviors of the T1, AISI 4140, and 6150 steels were similar. The white layer thickness was independent of the material and increased with increasing time. Both the case depth and the white layer thickness increased strongly with temp. while the hardness decreased. Only slight differences arise in the bulk structure during nitriding. Nitriding produces platelet or disk ppts. approx. 5-20 nm across on {001} matrix planes. These platelets show a striated morphol. which is the result of strain within the matrix. Electron microscopy showed tempering to continue in the core region during nitriding. The wear resistance of the steels increased by factors of 3.7-8.5 by nitriding. The coeff. of friction increased in the nitrided samples.
IT 52346-86-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(ion nitridation of)
RN 52346-86-8 CAPLUS
CN Steel, (UNS K11630) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.70	-	1.00	7439-96-5
Cr	0.40	-	0.65	7440-47-3
Si	0.20	-	0.35	7440-21-3

Mo	0.15	-	0.25	7439-98-7
C	0.12	-	0.21	7440-44-0
V	0.03	-	0.08	7440-62-2
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
Ti	0.01	-	0.03	7440-32-6
B	0.0005	-	0.005	7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST nitriding ion steel wear
IT Plasma nitriding
(of steels, low-alloy)
IT 12672-16-1, reactions 39370-53-1, reactions 52346-86-8, reactions 61333-12-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(ion nitridation of)
OS.CITING REF COUNT: 27 THERE ARE 27 CAPLUS RECORDS THAT CITE THIS RECORD (27 CITINGS)

L15 ANSWER 143 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1982:620685 CAPLUS Full-text
DOCUMENT NUMBER: 97:220685
ORIGINAL REFERENCE NO.: 97:36975a,36978a
TITLE: Drawn-arc stud welding to fine-grained structural steels and through zinc-plated elements
AUTHOR(S): Eichhorn, Friedrich; Langenbahn, Hans W.
CORPORATE SOURCE: Inst. Weld. Prod. Proc., Aachen Technical University, Aachen, Fed. Rep. Ger.
SOURCE: Schweissen & Schneiden (1982), 34(8), E144-E146, 373-7
CODEN: SCSCA4; ISSN: 0036-7184
DOCUMENT TYPE: Journal
LANGUAGE: English/German
AB The effects which a prodn.-applied coating has on weld quality in drawn-arc stud welding are discussed. The effects of preheating and the rates of heating up and cooling were detd. Investigations were also carried out for welding when moisture and scale are present, welding to plates carrying prodn.-applied coatings of various thicknesses, welding to abrasively cleaned plates through Sendzimir Zn-coated formwork, and use of a.c.. Welds at different operating temps. showed that from -10 to +250° the welding process itself did not produce any unacceptable flaws in the weld.
IT 39392-20-6
RL: USES (Uses)
(stud welding of fine-grain structural)
RN 39392-20-6 CAPLUS
CN Iron alloy, base, Fe 96-97,Ni 0.70-1.00,Mn 0.60-1.00,Cr 0.40-0.65,Mo 0.40-0.60,Cu 0.15-0.50,Si 0.15-0.35,C 0.10-0.20,V 0.03-0.08,S 0-0.04,P 0-0.035,B 0.0005-0.006 (UNS K11576) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Mn	0.55	-	1.10	7439-96-5
Ni	0.67	-	1.03	7440-02-0
Cr	0.36	-	0.69	7440-47-3
Mo	0.36	-	0.64	7439-98-7
Cu	0.12	-	0.53	7440-50-8
Si	0.13	-	0.37	7440-21-3
C	0.08	-	0.22	7440-44-0
V	0.02	-	0.09	7440-62-2
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.006	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST stud welding structural steel; galvanizing steel stud welding
IT Galvanized iron and steel
RL: USES (Uses)
(stud welding of fine-grain structural)
IT Welding

(stud, of steels, fine-grain structural)
IT 37270-34-1, uses and miscellaneous 39392-20-6 55405-17-9, uses and miscellaneous 58503-89-2, uses and miscellaneous 71497-79-5, uses and miscellaneous
RL: USES (Uses)
(stud welding of fine-grain structural)

L15 ANSWER 144 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1982:601438 CAPLUS Full-text
DOCUMENT NUMBER: 97:201438
ORIGINAL REFERENCE NO.: 97:33693a,33696a
TITLE: The use of controlled 20 and 40% hydrogen atmospheres in cementation and carbonitridation
AUTHOR(S): Tikhonov, A. K.; Sheindlin, B. E.; Chaikovskii, S. Z.; Krishtal, M. A.
CORPORATE SOURCE: Volgogr. Alum. Zavod, Volgograd, USSR
SOURCE: Metallovedenie i Termicheskaya Obrabotka Metallov (1982), (6), 30-3
CODEN: MTOMAX; ISSN: 0026-0819
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The effect of H concn. in controlled furnace atms. contg. 20 and 40% H on mech. properties and the rate of satn. of samples of Armco Fe and case-hardenable (18KhGT [12718-23-9], 30KhGT [37323-42-5], 20Kh3NA [12681-03-7], 20KhGNR [37312-00-8], and 19KhGN [37311-96-9]) and structural (45Kh [60999-09-9] and ShKh15 [12725-40-5]) steels and automobile parts of steel 16KhG [54342-41-5] during carburizing and carbonitriding was studied by reducing the atms. to a common C potential and maintaining the latter through the entire expt. The thickness of the layer during carburizing of autoparts in the atms. with 20 and 40% H was 1.4 and 1.6 mm, resp., and in carburizing of steel samples 1.3 and 1.4 mm, resp. The impact toughness, strength, and breaking force during static bending test were higher in the 20% H atm. In carbonitridation, C content in the 20% H atm. was 0.1% higher than that at 40% H, and the rate of part satn. was practically the same. In the atm. with 20% H, heat losses through the furnace brickwork decreased by 25%.
IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization and carbonitridation of case-hardenable, hydrogen in furnace controlled atms. for, mech. properties and satn. rate in relation to)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-7 (Ferrous Metals and Alloys)
ST steel carburizing atm hydrogen; carbonitridation atm hydrogen steel; Armco iron carbonitridation carburizing hydrogen
IT Controlled atmospheres
(endothermic, for carburization and carbonitridation of Armco iron and steels, hydrogen in, mech. properties and satn. rate in relation to)

IT Controlled atmospheres
(exothermic, for carburization and carbonitridation of Armco iron and steels, hydrogen in, mech. properties and satn. rate in relation to)
IT Carbonitridation and Cyanidation
Carburizing
(gas, of Armco iron and steels, hydrogen-contg. controlled atms. for, mech. properties and satn. rate in relation to)
IT 37311-96-9, reactions 37312-00-8 37323-42-5
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization and carbonitridation of case-hardenable, hydrogen in furnace controlled atms. for, mech. properties and satn. rate in relation to)
IT 1333-74-0, uses and miscellaneous
RL: USES (Uses)
(in carburization and carbonitridation atm. for Armco iron and case-hardenable and structural steels)

L15 ANSWER 145 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1982:203389 CAPLUS Full-text
DOCUMENT NUMBER: 96:203389
ORIGINAL REFERENCE NO.: 96:33503a,33506a
TITLE: Welding of steels for structural steel engineering
AUTHOR(S): Uwer, Dieter
CORPORATE SOURCE: Thyssen A.-G., Duisburg, D-4100/11, Fed. Rep. Ger.
SOURCE: Thyssen Technische Berichte (1981), 13(1), 69-75
CODEN: TBTHDV; ISSN: 0340-5060
DOCUMENT TYPE: Journal
LANGUAGE: German
AB The welding of fine-grain high-strength steels St E460 [55405-17-9] and St E690 [69683-64-3] was studied, including the process parameters, basic-coated electrodes, filler wires, fluxes, edge and groove prepn., and mech. properties of the welds. The alloying element concn. is selected based on the base metal to produce welds with the lowest H content. Preheating is generally necessary to prevent cold cracking in the welds. The preheating temp. depends on the alloying element concn. in both the base metal and the weld, plate thickness, welding heat input, residual stresses, and H content of the weld. The heat input is limited to obtain the specified mech. properties in the heat-affected zone and the weld, depending on mech. properties, weld temp., thickness, and weld. The welding parameters are controlled by the cooling time of the weld to obtain the required mech. properties.
IT 69683-64-3, uses and miscellaneous
RL: USES (Uses)
(welding of high-strength)
RN 69683-64-3 CAPLUS
CN Iron alloy, base, Fe 96-98,Mn 0.80-1.10,Cr 0.50-0.90,Si 0.50-0.90,Mo 0.40-0.60,C 0.15-0.21,Zr 0.05-0.15,S 0-0.040,P 0-0.035,B 0-0.0025 (UNS K11872) (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	96	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.90	7440-47-3
Si	0.50	-	0.90	7440-21-3
Mo	0.40	-	0.60	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
P	0	-	0.035	7723-14-0
S	0	-	0.004	7704-34-9
B	0	-	0.0025	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST welding high strength steel
IT Welding
(electrodes, of steels, fine-grain high-strength)
IT Welding
(fluxes, of steels, fine-grain high-strength)
IT Welding

(gas-shielded, of steels, fine-grain high-strength)
IT Welding
(submerged-arc, of steels, fine-grain high-strength)
IT 55405-17-9, uses and miscellaneous 69683-64-3, uses and miscellaneous
RL: USES (Uses)
(welding of high-strength)

L15 ANSWER 146 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1982:56015 CAPLUS Full-text
DOCUMENT NUMBER: 96:56015
ORIGINAL REFERENCE NO.: 96:9187a,9190a
TITLE: Effect of thermal treatment during welding on the dissolution and precipitation behavior of microalloying elements in the HAZ of fine-grained structural steels
AUTHOR(S): Schmidtmann, Eugen; Zeislmair, Ulrike
CORPORATE SOURCE: Aachen, Fed. Rep. Ger.
SOURCE: Archiv fuer das Eisenhuettenwesen (1981), 52(10), 399-406
CODEN: AREIAT; ISSN: 0003-8962
DOCUMENT TYPE: Journal
LANGUAGE: German
AB During simulation welding of steels, influence of heat treatment on the dissoln. and pptn. behavior of strength-increasing microalloying elements was studied. The cooling times of the various layers were 12-22 s. During the heat treatment of the 1st welding simulated layer with a max. temp. of 1350° at heating rates of 200°/s and holding times of 1 s, the ppts. present in the base metal dissolved. On cooling, no particles recognizable by electron microscopy pptd. Heat treatment of the 1st layer by the 2nd layer led in the Nb-alloyed exptl. steel [66992-73-2] to marked pptn. of Nb carbides <5 nm- diam. In StE47 [55405-17-9] and StE70 [39392-20-6] steels, ppts. formed as a consequence of the heat treatment of 2nd layer were recognized only sporadically. After heat treatment of the 3rd layer at ≤900°, marked pptn. of carbides occurred in StE47. In StE70, the no. of pptd. M3C carbides where M is metal increased only slightly. The heat treatment of the 4th and 5th layer produced in StE47 and StE70 coarse M3C pptd. at grain boundaries. Effect of stress-relief annealing 1 h at 580° was evaluated.
IT 39392-20-6
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(welding of, effect of heat treatment on pptn. and dissoln. of microalloying elements in)
RN 39392-20-6 CAPLUS
CN Iron alloy, base, Fe 96-97,Ni 0.70-1.00,Mn 0.60-1.00,Cr 0.40-0.65,Mo 0.40-0.60,Cu 0.15-0.50,Si 0.15-0.35,C 0.10-0.20,V 0.03-0.08,S 0-0.04,P 0-0.035,B 0.0005-0.006 (UNS K11576) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Mn	0.55	-	1.10	7439-96-5
Ni	0.67	-	1.03	7440-02-0
Cr	0.36	-	0.69	7440-47-3
Mo	0.36	-	0.64	7439-98-7
Cu	0.12	-	0.53	7440-50-8
Si	0.13	-	0.37	7440-21-3
C	0.08	-	0.22	7440-44-0
V	0.02	-	0.09	7440-62-2
S	0	-	0.040	7704-34-9
P	0	-	0.035	7723-14-0
B	0.0005	-	0.006	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST steel welding alloying element pptn
IT Welding
(of steels, effect of heat treatment on pptn. and dissoln. of microalloying elements in)
IT 39392-20-6 55405-17-9, uses and miscellaneous 66992-73-2,

uses and miscellaneous
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(welding of, effect of heat treatment on pptn. and dissoln. of microalloying elements in)

L15 ANSWER 147 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1981:195784 CAPLUS Full-text
DOCUMENT NUMBER: 94:195784
ORIGINAL REFERENCE NO.: 94:32003a,32006a
TITLE: Prediction of the effective thickness of a case-hardened layer
AUTHOR(S): Gliner, R. E.; Kharkevich, N. I.
CORPORATE SOURCE: Gor'k. Avto. Zavod, Gorkiy, USSR
SOURCE: Avtomobil'naya Promyshlennost (1981), 46(1), 26-8
CODEN: AVPRA3; ISSN: 0005-2337
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The carburization of hollow cylinders with wall thickness of 20 mm for steels 20Kh [37329-39-8], 27KhGR [58209-72-6], 20KhN2M [39411-21-7], 30KhMA [12672-15-0], and 18KhGT [12718-23-9] was done 7-14 h at 870-80° in endogas atm. with natural gas addns. The cylinders were then quenched in oil at 140°. Surface carburization was detd. in relation to C distribution in the carburized layer and hardness. Equation was developed for predicting the case depth.
IT 58209-72-6, uses and miscellaneous
RL: USES (Uses)
(case depth of carburized)
RN 58209-72-6 CAPLUS
CN Iron alloy, base, Fe 96-98,Cr 0.70-1.00,Mn 0.70-1.00,Si 0.17-0.37,C 0.25-0.31,Cu 0-0.30,Ni 0-0.30,W 0-0.30,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (27KhGR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	96	-	98	7439-89-6
Cr	0.70	-	1.00	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
C	0.25	-	0.31	7440-44-0
Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
W	0	-	0.30	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST steel cylinder carburizing
IT Carburizing
(case depth in, hardness of steel in relation to)
IT 12672-15-0, uses and miscellaneous 12718-23-9, uses and miscellaneous 37329-39-8, uses and miscellaneous 39411-21-7 58209-72-6, uses and miscellaneous 58209-73-7
RL: USES (Uses)
(case depth of carburized)

L15 ANSWER 148 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1980:499696 CAPLUS Full-text
DOCUMENT NUMBER: 93:99696
ORIGINAL REFERENCE NO.: 93:15901a,15904a
TITLE: Additives for welding of fine-grained structural steels
AUTHOR(S): Weyland, F.
CORPORATE SOURCE: Eisenberg, Fed. Rep. Ger.
SOURCE: DVS-Berichte (1980), 62(Feinkornbaustaehle - Schweissen Pruef.), 16-23

CODEN: DVSBA3; ISSN: 0418-9639
DOCUMENT TYPE: Journal
LANGUAGE: German

AB Fine-grain structural steels with a yield strength of ≥355 N/mm2 are welded with basic-coated steel electrodes to obtain mech. properties of the weld similar to those of the parent metal and prevent weld cracking due to H content of the weld transferred from the electrode. The mech. properties of the weld are tabulated for a no. of steel-electrode combinations. The effects of heat input and weld temp. on yield and tensile strengths, elongation, and brittle transition temp. were studied for welds deposited with an electrode Tenacito 75 [74566-90-8]. The basic coating of the electrode is hygroscopic and takes up water during storage, e.g., in 1 yr at 18-20° and humidity 35-70%, the water content increased from 0.28-0.74%. Therefore, the electrodes are dried 2 h at 300° to reduce the water content to <0.2% resulting in low-H steel weld.

IT 74566-46-4, uses and miscellaneous
RL: USES (Uses)
(welding of high-strength, dried coated electrodes for)

RN 74566-46-4 CAPLUS

CN Iron alloy, base, Fe 93-100,Mn 0-1.70,Ni 0-1.50,Cr 0-1.00,Si 0.15-0.80,Mo 0-0.60,Cu 0-0.50,C 0-0.20,V 0-0.10,Nb 0-0.05,P 0-0.025,S 0-0.025,B 0-0.005 (DIN 1.8927) (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	93 - 100	7439-89-6
Mn	0 - 1.70	7439-96-5
Ni	0 - 1.50	7440-02-0
Cr	0 - 1.00	7440-47-3
Si	0.15 - 0.80	7440-21-3
Mo	0 - 0.60	7439-98-7
Cu	0 - 0.50	7440-50-8
C	0 - 0.20	7440-44-0
V	0 - 0.10	7440-62-2
Nb	0 - 0.05	7440-03-1
P	0 - 0.025	7723-14-0
S	0 - 0.025	7704-34-9
B	0 - 0.005	7440-42-8

CC 55-10 (Ferrous Metals and Alloys)
ST welding steel electrode hydrogen

IT Welding
(of steel, high-strength, drying of coated electrodes for low hydrogen in)

IT Coating materials
(on welding electrodes, drying of, for low-hydrogen steel welds)

IT 1333-74-0, uses and miscellaneous
RL: REM (Removal or disposal); PROC (Process)
(removal of, in welding of high-strength steel, by drying of coated electrodes)

IT 37188-12-8, uses and miscellaneous 39334-59-3, uses and miscellaneous 39367-02-7 55061-73-9, uses and miscellaneous 55405-17-9, uses and miscellaneous 62068-41-1, uses and miscellaneous 74566-46-4, uses and miscellaneous 74566-47-5, uses and miscellaneous
RL: USES (Uses)
(welding of high-strength, dried coated electrodes for)

IT 74566-37-3, uses and miscellaneous 74566-38-4, uses and miscellaneous 74566-39-5, uses and miscellaneous 74566-40-8 74566-41-9 74566-42-0 74566-43-1 74566-44-2, uses and miscellaneous
RL: USES (Uses)
(welding with coated, of high-strength steel, drying for low hydrogen in)

IT 74566-90-8, uses and miscellaneous
RL: USES (Uses)
(welding with, of fine-grain structural steel, electrode drying effect on low-hydrogen in)

L15 ANSWER 149 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 1980:412105 CAPLUS Full-text
DOCUMENT NUMBER: 93:12105
ORIGINAL REFERENCE NO.: 93:2075a,2078a
TITLE: Interaction of titanium nitride with metallic melts
AUTHOR(S): Gurevich, Yu. G.; Frage, N. R.
CORPORATE SOURCE: Mashinostroit. Inst., Kurgen, USSR
SOURCE: Tezisy Nauchn. Soobshch. Vses. Konf. Str. Svoistvam Met. Shlakovykh Rasplavov, 3rd (1978), Volume 2, 184-6. Akad. Nauk SSSR, Ural. Nauchn. Tsentr: Sverdlovsk, USSR.
CODEN: 43GIAR
DOCUMENT TYPE: Conference
LANGUAGE: Russian
AB The kinetics of TiN dissoln. in Fe-O [12739-25-2], Fe-Ni [11148-11-1], steel ShKh15 [12725-40-5], 25KhGT [12741-98-9], and 20KhGNR [37312-00-8] were studied by using the rotating-specimen method. The TiN oxidn. rate in FeO in the 1st min was greatest and independent of time, in the 2nd min the rate decreased sharply, and after 2 min the TiN dissoln. ceased. TiN was coated with a dense oxide film. No TiN dissoln. occurred in Fe contg. <3% Ni. At >3% Ni TiN dissolved, and the Ti content in the melt increased. The Ti bonds increase in melts with increasing Ni concn. and decreased with stability of TiN in the melts.
IT 37312-00-8
RL: USES (Uses)
(soln. kinetics in molten, of titanium nitride)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 56-7 (Nonferrous Metals and Alloys)
ST titanium nitride soln steel; iron soln titanium nitride; oxygen soln titanium nitride; nickel soln titanium nitride
IT 11148-11-1 12725-40-5 12739-25-2 12741-98-9, uses and miscellaneous 37312-00-8
RL: USES (Uses)
(soln. kinetics in molten, of titanium nitride)
IT 25583-20-4
RL: PRP (Properties)
(soln. kinetics of, in iron and steel melts)

L15 ANSWER 150 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1979:424887 CAPLUS Full-text
DOCUMENT NUMBER: 91:24887
ORIGINAL REFERENCE NO.: 91:4085a,4088a
TITLE: Diffusion saturation of steels with chromium
AUTHOR(S): Babushkin, B. V.; Makharov, D. M.
CORPORATE SOURCE: USSR
SOURCE: Metallurgiya (Minsk) (1978), 12, 92-3
CODEN: MTRGBV; ISSN: 0369-2450
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Chromizing of steels 20KhNR [12742-15-3], 40KhN [12742-05-1], and

20Kh13 [37241-55-7] was carried out by aluminothermic redn. at 1050-1100° in a powder composed of Al2O3 29.40, Cr2O3 51.45, Al 17.15, and NH4Cl 2%. The diffusion layer contained a carbide zone of (Cr,Fe)23C6 and (Cr,Fe)7C3 phases and a solid soln. zone of high-Cr ferrite. The total depth of the diffusion zone decreased and the depth of the carbide zone increased with increasing C content. The max. microhardness (>2000 kg/mm2) was obsd. for Cr carbides on steel 40KhN, and min. (~1350 kg/mm2) for Cr carbides on steel 20Kh13.

IT 12742-15-3
RL: RCT (Reactant); RACT (Reactant or reagent)
(chromizing of, pack)

RN 12742-15-3 CAPLUS

CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-6 (Ferrous Metals and Alloys)

ST chromizing pack steel structure

IT Chromizing
(pack, of steels, carbide morphol. in)

IT 12742-05-1 12742-15-3 37241-55-7
RL: RCT (Reactant); RACT (Reactant or reagent)
(chromizing of, pack)

IT 12012-72-5DP, solid soln. with chromium carbide (Cr23C6) 12075-40-0DP, solid soln. with iron carbide (Fe7C3) 12075-42-2DP, solid soln. with chromium carbide (Cr7C3) 12105-81-6DP, solid soln. with iron carbide (Fe23C6)
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in chromized steel)

L15 ANSWER 151 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 1978:567295 CAPLUS Full-text

DOCUMENT NUMBER: 89:167295

ORIGINAL REFERENCE NO.: 89:25893a,25896a

TITLE: Stress corrosion susceptibility of highway bridge construction steels - phase IIB

AUTHOR(S): Caton, R. G.; Guthrie, J. L.; Carter, C. S.

CORPORATE SOURCE: Boeing Commerc. Airplane Co., Seattle, WA, USA

SOURCE: U. S. NTIS, PB Rep. (1976), PB-272493, 73 pp. Avail.: NTIS
From: Gov. Rep. Announce. Index (U. S.) 1977, 77(25), 135
CODEN: XPBRCA; ISSN: 0099-8583

DOCUMENT TYPE: Report

LANGUAGE: English

AB Eleven steels typically used in highway bridge construction were evaluated for stress corrosion resistance in various environments under tension. The effects of welding and 5% cold work were also investigated. Lab. tests were verified by exposure of specimens at selected locations in the United States. Both ASTM A325 [67954-12-5] and ASTM A490 [67954-11-4] bolts were evaluated for stress corrosion resistance in similar environments. The effects of hot dip galvanizing and mech. galvanizing on the stress corrosion susceptibility were also detd.

Suspension cable and prestressing wires were evaluated for stress corrosion resistance. The suspension cable wires were tested with no coating, and with hot dip galvanized and electrogalvanized coatings.

IT 52346-86-8, properties
RL: PRP (Properties)
(stress-corrosion susceptibility of, for highway bridge construction)

RN 52346-86-8 CAPLUS
CN Steel, (UNS K11630) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.70	-	1.00	7439-96-5
Cr	0.40	-	0.65	7440-47-3
Si	0.20	-	0.35	7440-21-3
Mo	0.15	-	0.25	7439-98-7
C	0.12	-	0.21	7440-44-0
V	0.03	-	0.08	7440-62-2
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
Ti	0.01	-	0.03	7440-32-6
B	0.0005	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST steel bridge construction stress corrosion; structural steel stress corrosion; galvanizing steel stress corrosion; weld steel stress corrosion; cold work steel stress corrosion
IT Galvanized iron and steel
RL: USES (Uses)
(for highway bridge construction)
IT Bridges
(for highways, structural steels for, stress-corrosion susceptibility of)
IT Welds
(in structural steels, in highway bridge construction)
IT Bolts
(structural steel, for highway bridge construction)
IT 12725-37-0, properties 12731-93-0, properties 12732-02-4, properties 12732-05-7, properties 52346-86-8, properties 58397-66-3, properties 63747-69-3, properties 63849-06-9, properties 67954-11-4, properties 67954-12-5, properties
RL: PRP (Properties)
(stress-corrosion susceptibility of, for highway bridge construction)

L15 ANSWER 152 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1978:533594 CAPLUS Full-text
DOCUMENT NUMBER: 89:133594
ORIGINAL REFERENCE NO.: 89:20639a,20642a
TITLE: Effect of atmospheric corrosion on fatigue strength of steels and welded joints
AUTHOR(S): Gregor, Vladimir
CORPORATE SOURCE: Mater. Test. Lab., Weld. Res. Inst., Bratislava, Czech.
SOURCE: Zvaracske Spravy (1976), 26(4), 73-80
CODEN: ZVSPDI; ISSN: 0322-9785
DOCUMENT TYPE: Journal
LANGUAGE: English/Slovak
AB Fatigue strength of base metal and butt-welded joints was detd. in bending and cyclic tension for the low-alloy steel, grades 15217.1 [12742-62-0], 11523.1 [71497-79-5], 16224 [60707-55-3], and 16224 + 0.37% Cu. Effects of corrosion on fatigue strength were detd. for accelerated chamber corrosion (5-150 cycles at 35° in SO2-contg. atm., with humidity and drying), and after 1-yr atm. exposure at a chem. plant. Corrosion rates were similar for all steels. The Cu-modified 16224 steel lost its surface corrosion layer after 30-50 cycles and developed a roughened surface, while the regular 16224 steel did not. Fatigue strength was rapidly decreased by corrosion exposure to ≤40 cycles, remaining nearly const. for longer cycling. Performance of 15217.1 steel was comparable to that of 11523.1 steel.
IT 60707-55-3

RL: PRP (Properties)
(fatigue and weld strength of, after corrosion)
RN 60707-55-3 CAPLUS
CN Iron alloy, base, Fe 95-97,Cr 0.70-1.00,Mn 0.70-1.00,Ni 0.70-1.00,Mo 0.30-0.50,Si 0.12-0.35,Cu 0-0.30,C 0.12-0.18,V 0.03-0.08,Ti 0-0.04,P 0-0.030,S 0-0.030,B 0.002-0.005 (CSN 16 224) (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Cr	0.70	-	1.00	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Ni	0.70	-	1.00	7440-02-0
Mo	0.30	-	0.50	7439-98-7
Si	0.12	-	0.35	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.12	-	0.18	7440-44-0
V	0.03	-	0.08	7440-62-2
Ti	0	-	0.04	7440-32-6
P	0	-	0.030	7723-14-0
S	0	-	0.030	7704-34-9
B	0.002	-	0.005	7440-42-8

CC 55-9 (Ferrous Metals and Alloys)
ST corrosion fatigue low alloy steel; weld fatigue corrosion steel; cyclic corrosion fatigue steel
IT Welding
(arc, of low-alloy steels, for fatigue and corrosion test)
IT Welds
(butt, in low-alloy steels, fatigue strength in relation to atm. corrosion of)
IT 12742-62-0 60707-55-3 71497-79-5, properties
RL: PRP (Properties)
(fatigue and weld strength of, after corrosion)
IT 7440-50-8, uses and miscellaneous
RL: USES (Uses)
(in low-alloy steels, accelerated chamber corrosion in relation to)
IT 64941-69-1 67661-29-4, uses and miscellaneous 67663-48-3, uses and miscellaneous
RL: USES (Uses)
(welding electrodes, for low-alloy steels)

L15 ANSWER 153 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1978:463151 CAPLUS Full-text
DOCUMENT NUMBER: 89:63151
ORIGINAL REFERENCE NO.: 89:9753a,9756a
TITLE: Determination of the chemical reaction rate constant during the treatment of steel in an endothermic atmosphere
AUTHOR(S): Gyulikhandanov, E. L.; Kislenkov, V. V.
CORPORATE SOURCE: Leningrad, USSR
SOURCE: Izvestiya Akademii Nauk SSSR, Metally (1978), (3), 189-91
CODEN: IZNMAQ; ISSN: 0568-5303
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The high-temp. measurement of elec. resistivity change in steel foil during carburization and decarburization were used to det. the temp. dependence of the reaction const. between endothermic atms. of different compns. and unalloyed γ-Fe. The reaction const. was related to the thermodn. activity of C in alloyed austenite at 925°, i.e., the carburization temp. The value is applicable to any alloy steel and with the diffusion coeff. data is useful in detg. the C distribution through the layer during carburization in the endothermic atm. Foils of Armco Fe and carburizing steels 12KhN3A [12750-62-8], 18Kh2N4VA [12742-21-1], 20KhGNR [37312-00-8], and 20Kh3MVF [37246-14-3] were used in the measurements.
IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)

(carburization of, in endothermic atm.)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST steel carburization endothermic atm
IT Carburizing
(of iron and steel in endothermic atm.)
IT 12742-21-1 12750-62-8 37246-14-3 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in endothermic atm.)

L15 ANSWER 154 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1977:62593 CAPLUS Full-text
DOCUMENT NUMBER: 86:62593
ORIGINAL REFERENCE NO.: 86:9887a,9890a
TITLE: Protection of parts in nonmuffle units from gaseous carbonitridation by chromium plating
AUTHOR(S): Rotin, A. I.; Fishtein, B. M.; Shluger, M. A.
CORPORATE SOURCE: Rostov.-na-Donu Nauchno-Issled. Inst. Tekhnol. Mashinostr., Rostov-on-Don, USSR
SOURCE: Zashchita Metallov (1976), 12(6), 716-18
CODEN: ZAMEA9; ISSN: 0044-1856
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Steel plated with Cr from a bath contg. CrO_3 350-400, H_2SO_4 1.9-2.0, Cr_2O_3 5-8, NaOH 40-60 g/L, at temp. 18-19° and c.d. 20-100 A/dm2 and after previous anodic surface cleaning at c.d. 25-60 A/dm2 had no diffusion of C or N in it. The depth of the cabronitridated layer in the nonprotected surfaces of the steel was 0.9-1.1 mm after 12.5 h.
IT 59738-82-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation of, chromium electroplate in prevention of)
RN 59738-82-8 CAPLUS
CN Steel, (20KhGNTR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.00	7439-96-5
Cr	0.40 - 0.70	7440-47-3
Ni	0.40 - 0.70	7440-02-0
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.18 - 0.24	7440-44-0
Ti	0.03 - 0.09	7440-32-6
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0.001	7440-42-8

CC 72-6 (Electrochemistry)
ST chromium electroplate steel carbonitridation
IT Carbonitridation and Cyanidation
(of steel, chromium electroplating in prevention of)
IT 12718-23-9, uses and miscellaneous 37329-39-8, uses and miscellaneous
51258-45-8 59738-82-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation of, chromium electroplate in prevention of)
IT 7440-47-3, uses and miscellaneous
RL: PRP (Properties)
(electroplating of, on steel, for carbonitridation prevention)

L15 ANSWER 155 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1977:20628 CAPLUS Full-text
DOCUMENT NUMBER: 86:20628
ORIGINAL REFERENCE NO.: 86:3299a,3302a
TITLE: Hardness of metals during strengthening by surface plastic deformation
AUTHOR(S): Yankov, N. I.; Aleksandrov, B. I.; Yankov, I. I.
CORPORATE SOURCE: Inst. Probl. Nadezhnosti Dolgovechnosti Mash., Minsk, USSR
SOURCE: Vestsi Akademii Navuk BSSR, Seryya Fizika-Tekhnichnykh Navuk (1976), (3), 5-9
CODEN: VABFAF; ISSN: 0002-3566
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The stress-strain relation for Cu, Al, and steels was examd. A method was applied for calcg. the max. hardness of the surface layer during strengthening by surface plastic deformation. For steels, the calcd. results agreed with exptl. data.
IT 59738-82-8, uses and miscellaneous
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(hardening of, by surface plastic deformation)
RN 59738-82-8 CAPLUS
CN Steel, (20KhGNTR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.00	7439-96-5
Cr	0.40 - 0.70	7440-47-3
Ni	0.40 - 0.70	7440-02-0
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.18 - 0.24	7440-44-0
Ti	0.03 - 0.09	7440-32-6
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0.001	7440-42-8

CC 56-7 (Nonferrous Metals and Alloys)
ST copper surface layer hardness; aluminum surface layer hardness; steel surface layer hardness; surface plastic deformation metal
IT 7429-90-5, properties 7440-50-8, properties 11121-90-7, properties 12611-78-8 12725-40-5 12731-93-0, properties 12732-25-1 12742-05-1 12742-24-4 12742-30-2 12743-82-7, uses and miscellaneous 12750-62-8 37268-90-9, properties 37269-19-5, properties 39294-21-8 59738-82-8, uses and miscellaneous 61431-72-9
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(hardening of, by surface plastic deformation)

L15 ANSWER 156 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1976:546672 CAPLUS Full-text
DOCUMENT NUMBER: 85:146672
ORIGINAL REFERENCE NO.: 85:23487a,23490a
TITLE: Protecting parts from gas carburization and carbonitriding by electroplating with chromium
AUTHOR(S): Rotin, A. I.; Fishtein, B. M.; Shluger, M. A.

CORPORATE SOURCE: Nauchno-Issled. Inst. Tsvetn. Metall., Rostov-on-Don, USSR
SOURCE: Metallovedenie i Termicheskaya Obrabotka Metallov (1976), (5), 49-50
CODEN: MTOMAX; ISSN: 0026-0819
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Cylindrical specimens of 20Kh [37329-39-8], 18KhGT [12718-23-9], 12KhN3A [12750-62-8], and 20KhGNTR [59738-82-8] steels were electroplated with Cr. Then, specimens were carbonitrided at 870° in an atm. contg. CO 18-19, H 42-44, CH4 1-2, NH3 3%, and balance N and oil quenched from 830°. The carbonitrided layer depth was 0.9-1.1 mm on the surface of the uncoated specimens. A 5 μ thick Cr coating inhibited diffusion of C and N. During carbonitriding, a thin interlayer of Cr23C6 and Cr7C3 formed at the Cr-steel interface. This carbide interlayer acted as a barrier to C diffusion.
IT 59738-82-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization and carbonitriding of, chromium electroplating for stopoff in)
RN 59738-82-8 CAPLUS
CN Steel, (20KhGNTR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.80 - 1.00	7439-96-5
Cr	0.40 - 0.70	7440-47-3
Ni	0.40 - 0.70	7440-02-0
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.18 - 0.24	7440-44-0
Ti	0.03 - 0.09	7440-32-6
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0.001	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST chromium electroplating protection steel carbonitriding
IT Carbonitridation and Cyanidation
Carburization
(of steel, chromium electroplate for stopoff in)
IT 12718-23-9, reactions 12750-62-8 37329-39-8, reactions 59738-82-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization and carbonitriding of, chromium electroplating for stopoff in)
IT 7440-47-3, uses and miscellaneous
RL: USES (Uses)
(electroplating on steel, as stopoff for carburization and carbonitriding prevention)

L15 ANSWER 157 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1976:436043 CAPLUS Full-text
DOCUMENT NUMBER: 85:36043
ORIGINAL REFERENCE NO.: 85:5831a,5834a
TITLE: Influence of different surface decarburization on the fatigue strength of spring steels
AUTHOR(S): Funke, Paul; Heye, Werner; Randak, Alfred; Sikora, Eduard
CORPORATE SOURCE: Clausthal-Zellerfeld, Fed. Rep. Ger.
SOURCE: Stahl und Eisen (1976), 96(1), 28-32
CODEN: STEIA3; ISSN: 0340-4803
DOCUMENT TYPE: Journal
LANGUAGE: German
AB Woehler curves were detd. for spring steels 65 Si 7 [131273-35-3], 55 Cr 3 [51835-92-8], 52 MnCrB 3 [59601-20-6] and 50 CrV 4 [39370-53-1]. Specimens were decarburization-annealed to C losses of 25, 50, and 70% at the surface, and some recarburized, then quenched and tempered to a tensile strength of 1500-1600 N/mm2, and finally fatigue tested under

torsional cyclic stress. C losses, in a 0.10 mm thick layer, to 75% of the initial C concn. of nondecarburized specimens have no detrimental effect on the fatigue strength. Decarburization to 50% of the initial C content has a slight effect. A marked redn. in fatigue strength occurs with a decarburization degree of 70%.
IT 59601-20-6, properties
RL: PRP (Properties)
(fatigue strength of, surface decarburization effect on)
RN 59601-20-6 CAPLUS
CN Steel, (DIN 1.7138) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	97 - 98	7439-89-6
Mn	0.75 - 1.00	7439-96-5
Cr	0.45 - 0.60	7440-47-3
C	0.48 - 0.55	7440-44-0
Si	0.15 - 0.35	7440-21-3
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
B	0 - 0.0005	7440-42-8

CC 55-8 (Ferrous Metals and Alloys)
ST decarburization fatigue spring steel
IT 39370-53-1, properties 51835-92-8, properties 59601-20-6, properties 131273-35-3
RL: PRP (Properties)
(fatigue strength of, surface decarburization effect on)

L15 ANSWER 158 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1976:48042 CAPLUS Full-text
DOCUMENT NUMBER: 84:48042
ORIGINAL REFERENCE NO.: 84:7875a,7878a
TITLE: Diffusion saturation of steel by carbon and manganese
AUTHOR(S): Rishchev, I. A.; Shcherbakov, E. D.; Khudokormova, R. N.; Martynyuk, M. N.
CORPORATE SOURCE: USSR
SOURCE: Khim.-Term. Obrab. Met. Splavov, Tezisy Dokl. Vses. Nauchn. Konf., 2nd (1974), 122-3. Editor(s): Lyakhovich, L. S. Beloruss. Politekh. Inst.: Minsk, USSR.
CODEN: 31GQAQ
DOCUMENT TYPE: Conference
LANGUAGE: Russian
AB The simultaneous cementation of 8 C and low-alloy steels with C and Mn [7439-96-5] in powd. Bondyuzhsk carburizing agent or ferromanganese [12604-53-4] or their mixts. contg. Al2O3 and NH4Cl (ferromanganese-Al2O3-NH4Cl ratio 67:30:3) took place in metal crucibles with consumable covers at 1000° during 4, 6, and 8 hr. The diffusion layers of high-Mn austenite with finely dispersed carbide inclusions formed in mixts. contg. the carburizer 50-80, ferromanganese 15-30, NH4Cl 1-2%, and the rest Al2O3, had wear resistances higher than that of G13 austenitic Mn steel.
IT 12742-15-3
RL: USES (Uses)
(carburization and manganese cementation of, with ferromanganese-contg. compns.)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 98	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.60 - 0.90	7439-96-5
Si	0.17 - 0.37	7440-21-3

Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST steel cementation carbon manganese; carburization steel ferromanganese; ferromanganese cementation steel
IT Cementation
(of steel with manganese, with ferromanganese-contg. mixts.)
IT Carburization
(of steels, combined with manganese cementation, with ferromanganese-contg. compns.)
IT 12725-33-6, uses and miscellaneous 12731-92-9, uses and miscellaneous 12742-15-3 12742-21-1 12743-82-7, uses and miscellaneous 12750-62-8 37268-90-9, uses and miscellaneous 73286-08-5, reactions
RL: USES (Uses)
(carburization and manganese cementation of, with ferromanganese-contg. compns.)
IT 12604-53-4
RL: USES (Uses)
(cementation of steels with mixts. contg., for simultaneous carburization and manganese cementation)
IT 7439-96-5, uses and miscellaneous
RL: USES (Uses)
(cementation with, combined with carburization, of carbon and low-alloy steels)

L15 ANSWER 159 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1975:535731 CAPLUS Full-text
DOCUMENT NUMBER: 83:135731
ORIGINAL REFERENCE NO.: 83:21327a,21330a
TITLE: Carburized steel for motor-driven link chains with good rupture strength, ductility, and hardness in surface and core
INVENTOR(S): Tamamura, Tateo; Nemoto, Tadashi; Tokunaga, Takeshi
PATENT ASSIGNEE(S): Hitachi, Ltd., Japan
SOURCE: Jpn. Tokkyo Koho, 3 pp.
CODEN: JAXXAD
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 49038413	B	19741017	JP 1970-5064	19700121

PRIORITY APPLN. INFO.: JP 1970-5064 19700121
AB The steels contain C 0.07-0.26, S-0.10-0.35, Mn 0.5-0.9, N-0.3-0.7, Cr 0.3-0.8, and B 0.001-0.10%, or C 0.07-0.26, S-0.1-0.35, Mn 0.5-0.9, Ni 0.2-0.7, Cr 0.2-0.8, Mo 0.1-0.5, and B 0.001-0.01%, or C 0.07-0.26, Si 0.1-0.35, Mn 0.5-0.9, Ni 0.7-2, Mo 0.1-0.5, and B 0.001-0.01%. The C content in the surface layer is 0.5-0.8%. The effective depth of the carburized layer is 1/80-1/25 of the diam. of the link element. The steel is hardened by the usual carborizing and quenching process, and has high rupture strength, ductility, and hardness in surface and core.
IT 56728-45-1, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, for chain links)
RN 56728-45-1 CAPLUS
CN Steel, Fe 97-99,Mn 0.5-0.9,Cr 0.3-0.8,Ni 0.3-0.7,Si 0.1-0.4,C 0.1-0.3,B 0-0.1 (9CI) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	99	7439-89-6

Mn	0.5	-	0.9	7439-96-5
Cr	0.3	-	0.8	7440-47-3
Ni	0.3	-	0.7	7440-02-0
Si	0.1	-	0.4	7440-21-3
C	0.1	-	0.3	7440-44-0
B	0	-	0.1	7440-42-8

IPCI C23C [ICM]; C22C [ICS]; B66D [ICS]
IPCR C22C0038-00 [I]; B66D0003-16 [I]; C23C0008-22 [I]
CC 55-10 (Ferrous Metals and Alloys)
ST carburization steel link chain; carburization steel link chain
IT Carburization
(of steel chain links)
IT Chains, mechanical
(steel, carburization of)
IT 56728-42-8 56728-43-9 56728-45-1, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, for chain links)

L15 ANSWER 160 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1975:483285 CAPLUS Full-text
DOCUMENT NUMBER: 83:83285
ORIGINAL REFERENCE NO.: 83:13051a,13054a
TITLE: Magnetic, electric, and mechanical properties of 20KhGR and 20KhGNR steels and their carburized layers
AUTHOR(S): Kuznetsov, I. A.; Somova, V. M.; Tsar'kova, T. P.; Bashkirov, Yu. P.
CORPORATE SOURCE: USSR
SOURCE: Struktura i svoistva tverdykh tel (1973), (1), 164-84
From: Ref. Zh., Metall. 1974, Abstr. No. 7I547
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Title only translated.
IT 37312-00-8 56995-50-7, properties
RL: USES (Uses)
(elec. and magnetic and mech. properties of carburized)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	97	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

RN 56995-50-7 CAPLUS
CN Iron alloy, base, Fe 96-98,Cr 0.75-1.05,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,Ni 0-0.30,C 0.18-0.24,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	96	-	98	7439-89-6
Cr	0.75	-	1.05	7440-47-3
Mn	0.70	-	1.00	7439-96-5
Si	0.17	-	0.37	7440-21-3

Cu	0	-	0.30	7440-50-8
Ni	0	-	0.30	7440-02-0
C	0.18	-	0.24	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-8 (Ferrous Metals and Alloys)
Section cross-reference(s): 76, 77
ST steel carburized property; magnetic property carburized steel; mech property carburized steel; elec property carburized steel
IT Electric property
Magnetic property and Magnetism
(of carburized steel)
IT 37312-00-8 56995-50-7, properties
RL: USES (Uses)
(elec. and magnetic and mech. properties of carburized)

L15 ANSWER 161 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1975:101616 CAPLUS Full-text
DOCUMENT NUMBER: 82:101616
ORIGINAL REFERENCE NO.: 82:16213a,16216a
TITLE: Carburization in an electrothermal fluidized bed
AUTHOR(S): Androshchuk, V. N.; Tsubanov, A. G.; Nikitin, V. S.
CORPORATE SOURCE: USSR
SOURCE: Sbornik Nauchnykh Trudov, Belorusskii Institut Mekhanizatsii Sel'skogo Khozyaistva (1972), 21, 195-7
CODEN: SBMKAP; ISSN: 0370-8640
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Carburization of 10-20 × 20-30 mm 20Kh, 20KhNR, and 18KhGT steel was accomplished in a Kryptol fluidized bed elec. furnace at 900-1000°. The carburization gas contained CO 20, CH4 3.8, H 13.5, CO2 1.2, and O 0.35%. A 1.25-mm carburized layer was obtained in 30 min. at 1000°.
IT 12742-15-3
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in fluidized bed)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B		0.001		7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST carburization chromium steel; electrothermal fluidized bed carburizing
IT Carburization
(of steel, in fluidized bed)
IT 12718-23-9, reactions 12742-15-3 37329-39-8, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)

(carburization of, in fluidized bed)

L15 ANSWER 162 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1974:405409 CAPLUS Full-text
DOCUMENT NUMBER: 81:5409
ORIGINAL REFERENCE NO.: 81:883a,886a
TITLE: Thermophysical properties of steel scale at different temperatures
AUTHOR(S): Severdenko, V. P.; Makushok, E. M.; Ravin, A. N.
CORPORATE SOURCE: Fiz.-Tekh. Inst., Minsk, USSR
SOURCE: Vestsi Akademii Navuk BSSR, Seryya Fizika-Tekhnichnykh Navuk (1974), (1), 33-7
CODEN: VABFAF; ISSN: 0002-3566
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The thermophys. properties (d. sp. heat, heat cond., and heat cond. coeff.) at 20-700° were detd. for the scale component oxides and for the scales on widely used forged and rolled 45, 25KhGT, 20KhNR, 40Kh, ShKh15, and Kh18N10T steels.
IT 12742-15-3
RL: USES (Uses)
(thermophys., of scale coatings on)
RN 12742-15-3 CAPLUS
CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	95	-	98	7439-89-6
Ni	0.80	-	1.10	7440-02-0
Cr	0.70	-	1.10	7440-47-3
Mn	0.60	-	0.90	7439-96-5
Si	0.17	-	0.37	7440-21-3
Cu	0	-	0.30	7440-50-8
C	0.16	-	0.23	7440-44-0
W	0	-	0.20	7440-33-7
Mo	0	-	0.15	7439-98-7
V	0	-	0.05	7440-62-2
P	0	-	0.035	7723-14-0
S	0	-	0.035	7704-34-9
Ti	0	-	0.03	7440-32-6
B	0.001			7440-42-8

CC 55-8 (Ferrous Metals and Alloys)
ST thermophys property steel scale; oxide scale forged rolled steel; stainless steel scale; alloy low steel scale
IT Heat capacity
Thermal conductivity and conduction
(of scale, on steel)
IT Scale (coating)
(thermophys. properties of, on steel)
IT 1309-37-1, properties 1317-61-9 1345-25-1, properties
RL: PRP (Properties)
(thermophys., in scale on steel)
IT 12611-78-8 12725-40-5 12741-98-9, properties 12742-15-3 37268-90-9, properties 39344-94-0, properties
RL: USES (Uses)
(thermophys., of scale coatings on)

L15 ANSWER 163 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1974:29530 CAPLUS Full-text
DOCUMENT NUMBER: 80:29530
ORIGINAL REFERENCE NO.: 80:4865a,4868a
TITLE: Effect of chemicothermal treatment in hydrogen-containing atmospheres on static crack and brittle strengths of case-hardened steel
AUTHOR(S): Dukarevich, I. S.; Balter, M. A.
CORPORATE SOURCE: USSR

SOURCE: Vestnik Mashinostroeniya (1973), 53(8), 62-5
CODEN: VMASAV; ISSN: 0042-4633
DOCUMENT TYPE: Journal
LANGUAGE: Russian

AB Thermochem. treatment is developed in controlled gas atm. contg. H, which is readily adsorbed on the surface. The diffusion coeff. of H is 3-4 orders higher than the diffusion coeffs. of C and N in Fe, and therefore the depth of H-satd. zone is considerably greater than that of the case-hardened or carbonitrided layers. The effects of H satn. on static and brittle strength of steels, after various carburizing treatments in natural gas, carbonitridation in natural gas and ammonia, hardening of carburized steel with heating in endogas with or without addn. of natural gas were studied for the core and the diffusion-coated layer at a relative carburized layer depth 0.25-0.33. A decrease in strength and plasticity during static bending and elongation testing of carburized 20Kh2N4A (Cr-Ni) steel was obsd. The effect of H pickup of steel during treatment in a H-contg. atm., causing a decrease in static and brittle strengths, must be considered in use of diffusion coating. For casehardening and carbonitridation the steel contains ≤0.25% C. Steel with 0.30-0.35% C is extremely sensitive to embrittlement by H. Satn. with H during casehardening and carbonitridation does not decrease the resistance to brittle fracture if the steel is subsequently hardened after heating in air for H desorption, resulting in improved strength and plasticity.

IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, hydrogen effect on plasticity and strength in relation to)

RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST carburization steel mech property; carbonitridation steel mech property; cementation steel hydrogen embrittlement

IT Natural gas
RL: USES (Uses)
(carbonitridation in, of steels, plasticity and strength in relation to)

IT Diffusion
(of hydrogen in casehardening of steels, plasticity and strength in relation to)

IT Carbonitridation and Cyanidation
Carburization
(of steels, hydrogen effect on plasticity and strength in relation to)

IT 1333-74-0, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation in gases contg., of steels, plasticity and strength in relation to)

IT 7664-41-7, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carbonitridation in, of steels, plasticity and strength in

relation to)
IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, hydrogen effect on plasticity and strength in relation to)

L15 ANSWER 164 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1973:548421 CAPLUS Full-text
DOCUMENT NUMBER: 79:148421
ORIGINAL REFERENCE NO.: 79:24039a,24042a
TITLE: Production and working of a water-quenched and tempered chromium-molybdenum-zirconium low-alloy-structural steel
AUTHOR(S): Neuhaus, Werner; Degenkolbe, Joachim
CORPORATE SOURCE: Thyssen Niederrhein A.-G., Oberhausen, Fed. Rep. Ger.
SOURCE: Thyssenforschung (1971), 3(3-4), 136-44
CODEN: THYSAQ; ISSN: 0563-5004
DOCUMENT TYPE: Journal
LANGUAGE: German
AB Water-quenched and tempered low-alloy structural steel (N-A-XTRA 65 and 70) contg. C ≤ 0.20, Mn 0.7-1.1, Si 0.5-0.9, Cr 0.6-1.0, Mo 0.2-0.6, and Zr 0.06-0.12% is usually made by the open-hearth process, but also by the LD or elec.-furnace process and vacuum-degassed. By tempering, a ferritic matrix with a very fine dispersion of cementite is obtained, having high strengths with great ductility. The steel can easily by cold-formed. Welding with basic-coated welding rods yields welds with good mech. properties, equal to those of the base metal, even without any preheating.
IT 12604-89-6P, preparation
RL: PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(manuf. of)
RN 12604-89-6 CAPLUS
CN Steel, (UNS K11856) (CA INDEX NAME)

Component	Component Percent			Component Registry Number
Fe	97	-	98	7439-89-6
Mn	0.80	-	1.10	7439-96-5
Cr	0.50	-	0.80	7440-47-3
Si	0.40	-	0.80	7440-21-3
Mo	0.18	-	0.28	7439-98-7
C	0.15	-	0.21	7440-44-0
Zr	0.05	-	0.15	7440-67-7
S	0	-	0.04	7704-34-9
P	0	-	0.035	7723-14-0
B	0	-	0.0025	7440-42-8

CC 55-1 (Ferrous Metals and Alloys)
ST high strength structural steel; welding high strength steel; chromium molybdenum low alloy steel; zirconium contg low alloy steel
IT Welding
(of steel, water-quenched tempered)
IT Weldability
(of structural steels, water-quenched and tempered high-strength)
IT 12604-89-6P, preparation
RL: PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(manuf. of)

L15 ANSWER 165 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1973:482245 CAPLUS Full-text
DOCUMENT NUMBER: 79:82245
ORIGINAL REFERENCE NO.: 79:13333a,13336a
TITLE: Improvement of gas carburization
AUTHOR(S): Beloruchev, L. V.; Korolev, V. A.; Cherepkova, K. F.
CORPORATE SOURCE: USSR
SOURCE: Nadezhnost Dolgovechnost Metal. Mater. Mashinostr.

Priborostr. (1972) 99-102
From: Ref. Zh., Met. 1973, Abstr. No. 1I786
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Progress in gas carburization by using endothermically controlled atms. as carrier gas in the USSR and abroad was studied. The feasibility of carburization in N with addn. of natural gas was tested. Steel 20KhGNR (Cr-Mn-Ni-B) was heated in an exptl. furnace at 940° for 10 hr in a mixt. of N with 6% H and 5% natural gas. A 1-8 mm carburized layer was obtained and internal oxidn. was absent. The carburizing capacity of a N-natural gas mixt. was high as was the diffusion rate of C in this mixt.
IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in natural gas contg. nitrogen)
RN 37312-00-8 CAPLUS
CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST gas carburization alloy steel; natural gas carburization steel; chromium manganese steel carburization; nickel chromium steel carburization; boron contg steel carburization
IT Natural gas
RL: USES (Uses)
(carburization of steel in nitrogen-contg.)
IT Carburization
(of steel, in natural gas contg. nitrogen)
IT 7727-37-9, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of steel in natural gas contg.)
IT 37312-00-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(carburization of, in natural gas contg. nitrogen)

L15 ANSWER 166 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1973:162649 CAPLUS Full-text
DOCUMENT NUMBER: 78:162649
ORIGINAL REFERENCE NO.: 78:26093a,26096a
TITLE: Strength characteristics of scale
AUTHOR(S): Severdenko, V. P.; Makushok, E. M.; Ravin, A. N.
CORPORATE SOURCE: Minsk, USSR
SOURCE: Izvestiya Akademii Nauk SSSR, Metally (1973), (1), 123-7
CODEN: IZNMAQ; ISSN: 0568-5303
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB A method for detg. the yield strength, σ, of scales on St. 45, ShKh15, Kh18N10T, 20KhNR, and 25KhGT steels is discussed, and σ values for these scales at various temps. (t = 600-1150°) and degrees of deformation (0.50-0.80) are tabulated. At high temp. and similar deformation conditions, the strengths of scales are lower than those of steels, i.e. scale decreases the friction coeff. of steels

and can act as a lubricant during forming of steel. In absence of phase transformation in scales, their σ-t relations are exponential.

IT 12742-15-3, properties
RL: USES (Uses)
(yield strength of scale on)

RN 12742-15-3 CAPLUS

CN Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si 0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 98	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.60 - 0.90	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-11 (Ferrous Metals and Alloys)

ST yield strength mill scale; friction steel scale strength

IT Scale (coating)
(mill, yield strength of)

IT 12725-40-5 12741-98-9, properties 12742-15-3, properties 37268-90-9, properties 54611-20-0
RL: USES (Uses)
(yield strength of scale on)

L15 ANSWER 167 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN

ACCESSION NUMBER: 1972:529437 CAPLUS Full-text

DOCUMENT NUMBER: 77:129437

ORIGINAL REFERENCE NO.: 77:21303a,21306a

TITLE: Use of protective glass coatings during the heat treatment of steel components

AUTHOR(S): Emel'yanenko, N. L.; Shagabutdinov, R. I.; Valeev, R. M.; Smirnova, L. P.

CORPORATE SOURCE: Chelyab. Trakt. Zavod, Chelyabinsk, USSR

SOURCE: Metallovedenie i Termicheskaya Obrabotka Metallov (1972), (7), 74-5
CODEN: MTOMAX; ISSN: 0026-0819

DOCUMENT TYPE: Journal

LANGUAGE: Russian

AB The protective capacities of various coatings deposited on the surfaces of R12 and R18 (Cr-W-V), St. 45, R6M3 and R9K5 (Cr-Co-W-V), R9M4 (Cr-W-V), 20Kh (Cr), and 20KhGNR (Cr-Mn-Ni-B) steels during heating at 1250-1400° were examd. All the steels were preheated at 860° for 30 min, annealed at 1240-70° for 15-20 min, and oil quenched. Preliminary results showed that the best protective properties were achieved by using an enamel of the EZh-01 type contg. -25% Al2O3. The same enamel was used to protect the steels 20KhGNR and 18Kh2N4VA (Cr-Ni-W) from decarburization during their thermal treatment (annealing at 870° for 2 hr and quenching from 880°, then tempering at 220° for 4 hr). In the presence of EZh-01, decarburization is completely suppressed, whereas in its absence the depth of the decarburized zone may reach 0.1 mm. After the thermal treatment, the coating can be easily removed by shot blasting or by dissolving in molten KOH or NaOH at 500-50°.

IT 37312-00-8
RL: USES (Uses)
(heat treatment of, protective glass coatings for)

RN 37312-00-8 CAPLUS

CN Iron alloy, base, Fe 95-97,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.70-1.00,Si

0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S 0-0.035,Ti 0-0.03,B 0.001 (20KhGNR) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Fe	95 - 97	7439-89-6
Ni	0.80 - 1.10	7440-02-0
Cr	0.70 - 1.10	7440-47-3
Mn	0.70 - 1.00	7439-96-5
Si	0.17 - 0.37	7440-21-3
Cu	0 - 0.30	7440-50-8
C	0.16 - 0.23	7440-44-0
W	0 - 0.20	7440-33-7
Mo	0 - 0.15	7439-98-7
V	0 - 0.05	7440-62-2
P	0 - 0.035	7723-14-0
S	0 - 0.035	7704-34-9
Ti	0 - 0.03	7440-32-6
B	0.001	7440-42-8

CC 55-6 (Ferrous Metals and Alloys)
ST coating steel heat treatment; enamel coating steel; decarburization prevention steel enameling
IT Coating removers
(alkali metal hydroxide, for protective glass dissoln. on steel after heat treatment)
IT Enamels
(aluminum oxide-contg., on steel for decarburization prevention during heat treatment)
IT Glass
RL: USES (Uses)
(coatings, on steel for decarburization prevention during heat treatment)
IT Coating materials
(glass, on steel for decarburization prevention during heat treatment)
IT 1310-58-3, uses and miscellaneous 1310-73-2, uses and miscellaneous
RL: USES (Uses)
(glass coating removal by molten, from heat-treated steel)
IT 12715-04-7, uses and miscellaneous 12743-13-4 37241-62-6 37302-40-2 37302-41-3 37302-42-4, uses and miscellaneous 37312-00-8 37329-39-8, uses and miscellaneous
RL: USES (Uses)
(heat treatment of, protective glass coatings for)

L15 ANSWER 168 OF 168 CAPLUS COPYRIGHT 2021 ACS on STN
ACCESSION NUMBER: 1972:116614 CAPLUS Full-text
DOCUMENT NUMBER: 76:116614
ORIGINAL REFERENCE NO.: 76:18841a,18844a
TITLE: Mechanical properties of nitrocemented steels at static loads
AUTHOR(S): Rozenberg, S. E.
CORPORATE SOURCE: USSR
SOURCE: Khim.-Term. Obrab. Metal. Splavov (1971) 98-101
From: Ref. Zh., Met. 1971, Abstr. No. 10I398
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB The effects of the carbonitrided layer depth (0.55, 0.8, and 1.1), chem. compn., and microstructure on the notch toughness and tensile strength (during bending and torsion) were detd. for the 20KhNR, 25KhGM, and 25KhGT steels. The carbonitrided 20KhNR steel had better mech. properties than the 25KhGM and 25KhGT steels. An increase in the carbonitrided layer depth from 0.55 to 1.1 mm results in a decrease of tensile strength during bending, notch toughness, and torsion angle, but increased the torsional strength. The content of N in the carbonitrided layer should be ≤0.3%. Cold treatment decreased all of the mech. properties. The carbonitrided 25KhGM steel has a strength similar to that of the 20KhNR steel. The 25KhGT steel has the lowest strength but the plasticity of its carbonitrided layer is higher than that on the

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     25KhGM steel.
IT   12742-15-3, properties
     RL: PRP (Properties)
        (mech., carbonitridation effect on)
RN   12742-15-3  CAPLUS
CN   Iron alloy, base, Fe 95-98,Ni 0.80-1.10,Cr 0.70-1.10,Mn 0.60-0.90,Si
     0.17-0.37,Cu 0-0.30,C 0.16-0.23,W 0-0.20,Mo 0-0.15,V 0-0.05,P 0-0.035,S
     0-0.035,Ti 0-0.03,B 0.001 (20KhNR)  (CA INDEX NAME)

Component        Component           Component
                  Percent          Registry Number
=========+=======================+===============
    Fe          95     -  98          7439-89-6
    Ni           0.80  -   1.10        7440-02-0
    Cr           0.70  -   1.10        7440-47-3
    Mn           0.60  -   0.90        7439-96-5
    Si           0.17  -   0.37        7440-21-3
    Cu           0     -   0.30        7440-50-8
    C            0.16  -   0.23        7440-44-0
    W            0     -   0.20        7440-33-7
    Mo           0     -   0.15        7439-98-7
    V            0     -   0.05        7440-62-2
    P            0     -   0.035       7723-14-0
    S            0     -   0.035       7704-34-9
    Ti           0     -   0.03        7440-32-6
    B                0.001            7440-42-8

CC   55 (Ferrous Metals and Alloys)
ST   carbonitrided steel property
IT   Carbonitridation and Cyanidation
        (of steel, mech. properties in relation to)
IT   12597-69-2, properties   12741-98-9, properties   12742-15-3,
     properties
     RL: PRP (Properties)
        (mech., carbonitridation effect on)



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	ARCELORMITTAL
Inventor(s):	Drillet et al.
Application No.:	17319306
Filed:	May 13, 2021
Examiner:	TBD
Attorney Docket No.:	20631.1028CON7
Confirmation No.:	1093
Title:	Coated Steel Strips, Coated Stamped Products and Methods

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

November 29, 2021

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.56

Sir:

In accordance with the provisions of 37 C.F.R. § 1.97, Applicants hereby make of record the documents listed on the four (4) accompanying Forms PTO/SB/08a for consideration by the Examiner in connection with the examination of the above-identified patent application. While the references are being submitted herewith, some or all of the references may not constitute prior art under the U.S. patent laws.

This Information Disclosure Statement is filed after the mailing date of the First Office Action, and is accompanied by the requisite fee.

In the event any fee is due or an overpayment is made in connection with this submission, the Commissioner is hereby authorized to charge said deficiency or credit said overpayment to our Deposit Account No. 50-0552.

Respectfully submitted,

DAVIDSON, DAVIDSON & KAPPEL, LLC

By: /williamcgehris/
William C. Gehris, Reg. No. 38,156

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Electronic Acknowledgement Receipt	
EFS ID:	44379436
Application Number:	17319306
International Application Number:	
Confirmation Number:	1093
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods
First Named Inventor/Applicant Name:	Pascal DRILLET
Customer Number:	23280
Filer:	William C. Gehris/Simon Steiner
Filer Authorized By:	William C. Gehris
Attorney Docket Number:	20631.1028CON7
Receipt Date:	29-NOV-2021
Filing Date:	13-MAY-2021
Time Stamp:	13:12:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$260
RAM confirmation Number	E2021ASD12581666
Deposit Account	500552
Authorized User	Simon Steiner
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	A03Evidence7InfluenceofHotDeformationFF.pdf	638520 27fc5f90f26de108ceef01d4e7fa1f1b88b0d0d95f	no	7
Warnings:					
Information:					
2	Non Patent Literature	A04Evidence9Variouscharacteristicsofaluminum FF.pdf	565568 859e88f3a2f9a21c6ee258b1451be84138e242afe	no	6
Warnings:					
Information:					
3	Non Patent Literature	A05Ev12ThehightemperatureoxidationFF.pdf	737897 ed1e48fc092a7faef998e1f1a4bfc653de77a637ed5	no	5
Warnings:					
Information:					
4	Non Patent Literature	A06Evidence16EtudethermoFF.pdf	16379466 7350de8f3169aea73e3e1d13f438ed8809e12f03	no	84
Warnings:					
Information:					
5	Non Patent Literature	A07Ev18NewpracticalhardwareFF.pdf	14791302 3871d27432fa0c586ccb9032abee83e508cc77fde	no	33
Warnings:					
Information:					
6	Non Patent Literature	A08Ev19BasisforMaterialScienceZHAOFFFF.pdf	1859094 25e51d053e4eee255c65c3e73554f2a6d1cb7202	no	15
Warnings:					
Information:					

7	Non Patent Literature	A09EV20IsothermalTransformationKEGONGFF.pdf	1511012 87e8e1b85e175d2c653396622769c132e8615d9039	no	10
Warnings:					
Information:					
8	Non Patent Literature	A10EV21HeatTreatmentofIronandSteelFF.pdf	4296536 07a2e9d3cc2298864 1ef52dc1ec32fe5360e48da	no	17
Warnings:					
Information:					
9	Non Patent Literature	A11EV22HeatassistedForming.pdf	2967006 601a0e90691c52d89c991a2588e1ca38edf95317c	no	11
Warnings:					
Information:					
10	Non Patent Literature	A12EV44BinvestigationFF.pdf	3173678 169e05a63f113cc784c0ece27accad61182580cec	no	18
Warnings:					
Information:					
11	Non Patent Literature	A13EV47FundamentalsofMaterialSciencePANFF.pdf	485816 a10e20d51ecd9f760830979cd98bb06caa5a3775	no	9
Warnings:					
Information:					
12	Information Disclosure Statement (IDS) Form (SB08)	1449nov2021.pdf	461105 1c06e6c6ac2d0bdd7f19c796e2e1675a541e54c76	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
13	Information Disclosure Statement (IDS) Form (SB08)	IDSltrNov2021.pdf	202220 e512815fe88e016222550c10e7935fcd0a7656e551	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					

14	Fee Worksheet (SB06)	fee-info.pdf	38120 [redacted]	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	48107340	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal				
Application Number:	17319306			
Filing Date:	13-May-2021			
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods			
First Named Inventor/Applicant Name:	Pascal DRILLET			
Filer:	William C. Gehris/Simon Steiner			
Attorney Docket Number:	20631.1028CON7			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**260**

FORM PTO-1449 (REV. 7-80)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. 20631.1028CON7	APPLICATION NO 17319306
LIST OF PRIOR ART CITED BY APPLICANT		APPLICANT ArcelorMittal	
(Use several sheets if necessary)		FILING DATE 05-13-2021	GROUP 1784

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	
	A01						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION	
					YES	NO
	A02					

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	A03	**Influence of Hot Deformation On Continuous Cooling Bainitic Transformation in a Low Carbon Steel", Z. D. Wang et al., Acta Metallurgica Sinica, Vol. 11, No. 2, pp 121-127, April 1998**
	A04	**"Various characteristics of aluminum-coated steel sheet for hot pressing", Masayoshi Suehiro et al., Nippon Steel Technical Report, No. 378 (2003), pages 15-20, see English Abstract**
	A05	**The high-temperature oxidation behavior of hot-dipping Al-Si coating on low carbon steel", Chaur-Jeng Wang et al., Surface & Coatings Technology 200 (2006) 6601-6605**
	A06	**Etude thermo-mécanique et modélisation numérique de l' emboutissage à chaud de l'Usibor 1500, Lucia Garcia Aranda, the cover, the table of contents, pages 1-15, 40-51, 82 and 104-106 see machine translation**
	A07	**New Practical Hardware Manual, edited by JIAN Guangyi, China Electric Power Press, first edition and first printing in August 2005, the title page, the copyright information page, the preface, the table of contents, page 43, see partial translation**
	A08	**Basis for Material Science, edited by ZHAO Pin et al., Harbin Institute of Technology Press, first edition and first printing in August 1999, the title page, the copyright information page, the preface, the foreword, the table of contents, page 177- 178**
	A09	**Isothermal Transformation Curve of Steel, edited by Yang Kegong, Heilongjiang People's Publishing House, first edition and first printing in August 1981, the title page, the copyright information page, the preface, the table of contents and partial translation**
	A10	**Heat Treatment of Iron and Steel—Principle and Application, editing group of the Heat Treatment of Iron and Steel, Shanghai Scientific and Technical Publishers, first edition and first printing in January 1979, the title page, the copyright information page, the preface, the table of contents, pages 20-23 and partial translation**
	A11	**Heat-Assisted Forming Theory for Sheet Metals, edited by MIN Junying et al, Tongji University Press, first edition and first printing in August 2014, the title page, the copyright information page, the preface, the table of contents, page 70 and partial translation**
	A12	**Basic Investigations on the Hot Stamping Steel 22MnB5", M.Geiger et al., Advanced Materials Research, Vols 6-8 (May 2005) pp.795-802**
	A13	**Translation of Fundamentals of Material Science, PAN Jinsheng et al., Tsinghua University Press, first edition in June 1998 and fourth printing in August 2003, the cover, the title page, the copyright information page, the catalogue, pages 593-597**

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with **MPEP 609**; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/319,306	Filing Date 05/13/2021	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/23/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ROLITA M WIMBUSH/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/22 (10-20)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 20631.1028CON7
Application Number 17319306	Filed 05-31-2021
For Coated Steel Strips, Coated Stamped Products and Methods	
Art Unit 1784	Examiner SCHLEIS, DANIEL J

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$220	$110	$55	$
☑	Two months (37 CFR 1.17(a)(2))	$640	$320	$160	$ 640
☐	Three months (37 CFR 1.17(a)(3))	$1,480	$740	$370	$
☐	Four months (37 CFR 1.17(a)(4))	$2,320	$1,160	$580	$
☐	Five months (37 CFR 1.17(a)(5))	$3,160	$1,580	$790	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 500552.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 36561.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Cary Kappel/ — Signature

February 23, 2022 — Date

Cary Kappel — Typed or printed name

212 736 1940 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	ARCELORMITTAL
Inventor(s):	Drillet et al.
Application No.:	17319306
Filed:	May 13, 2021
Examiner:	TBD
Attorney Docket No.:	20631.1028CON7
Confirmation No.:	1093
Title:	Coated Steel Strips, Coated Stamped Products and Methods

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

February 23, 2022

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.56

Sir:

In accordance with the provisions of 37 C.F.R. § 1.97, Applicants hereby make of record the documents listed on the four (4) accompanying Forms PTO/SB/08a for consideration by the Examiner in connection with the examination of the above-identified patent application. While the references are being submitted herewith, some or all of the references may not constitute prior art under the U.S. patent laws.

This Information Disclosure Statement is filed after the mailing date of the First Office Action, and is accompanied by the requisite fee.

In the event any fee is due or an overpayment is made in connection with this submission, the Commissioner is hereby authorized to charge said deficiency or credit said overpayment to our Deposit Account No. 50-0552.

Respectfully submitted,

DAVIDSON, DAVIDSON & KAPPEL, LLC

By: /williamcgehris/
William C. Gehris, Reg. No. 38,156

DAVIDSON, DAVIDSON & KAPPEL, LLC
589 Eighth Ave, 22nd Floor
New York, NY 10018
(212) 736-1940

Electronic Acknowledgement Receipt	
EFS ID:	45061914
Application Number:	17319306
International Application Number:	
Confirmation Number:	1093
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods
First Named Inventor/Applicant Name:	Pascal DRILLET
Customer Number:	23280
Filer:	William C. Gehris/Simon Steiner
Filer Authorized By:	William C. Gehris
Attorney Docket Number:	20631.1028CON7
Receipt Date:	23-FEB-2022
Filing Date:	13-MAY-2021
Time Stamp:	11:11:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$900
RAM confirmation Number	E20222MB12094687
Deposit Account	500552
Authorized User	Simon Steiner
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges) 37 CFR 1.20 (Post Issuance fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.16 (National application filing, search, and examination fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1028CON7-RTOA-DFT-7dec21.pdf	522344	yes	15
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment/Request for Reconsideration-After Non-Final Rejection		1	1	
	Claims		2	6	
	Applicant Arguments/Remarks Made in an Amendment		7	15	
Warnings:					
Information:					
2	Non Patent Literature	Exhibit2010SecondDeclarationofDrDeArdo.pdf	1847972	no	130
Warnings:					
Information:					
3	Non Patent Literature	IPR201901275No30HearingTranscriptHearingTranscriptPTABNov102020.pdf	184598	no	52
Warnings:					
Information:					
4	Non Patent Literature	54DeclarationGrigorieva.pdf	2557842	no	5
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	IDSltrFeb2022.pdf	202217	no	2

Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
6	Extension of Time	extension.PDF	172358 [illegible]	no	2
Warnings:					
Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	1449Feb2022.pdf	374515 [illegible]	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
8	Fee Worksheet (SB06)	fee-info.pdf	40758 [illegible]	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5902604		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

FORM PTO-1449 (REV. 7-80)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO.	APPLICATION NO
		20631.1028CON7	17319306
LIST OF PRIOR ART CITED BY APPLICANT		APPLICANT	
		ArcelorMittal	
(Use several sheets if necessary)		FILING DATE	GROUP
		05-13-2021	1784

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	
	A01						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION	
					YES	NO
	A02					

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	A03	Second Declaration of Dr. DeArdo (April 7, 2020) submitted on April 8, 2020 in IPR 2019-01275, re US 9,708,683 B2
	A04	Record of Oral Hearing, Oral Hearing Held on October 7, 2020, Transcript, IPR 2019-01275, re US 9,708,683 B2
	A05	Declaration by Dr Grigorieva dated 09/28/2016 and curriculum vitae

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with **MPEP 609**; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Patent Application Fee Transmittal					
Application Number:	17319306				
Filing Date:	13-May-2021				
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods				
First Named Inventor/Applicant Name:	Pascal DRILLET				
Filer:	William C. Gehris/Simon Steiner				
Attorney Docket Number:	20631.1028CON7				
Filed as Large Entity					
Filing Fees for Utility under 35 USC 111(a)					
Description		**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:					
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Patent-Appeals-and-Interference:					
Post-Allowance-and-Post-Issuance:					
Extension-of-Time:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	1252	1	640	640
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**900**

Amendments to the Claims:

The following listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1-24 (canceled).

Claim 25 (Previously presented) A hot stamped coated steel product, which comprises:

(a) a strip of base steel having a first side and a second side; and

(b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel, wherein:

(i) said coating results from interdiffusion between said base steel and an aluminum or aluminum alloy pre-coating, and

(ii) wherein said coating comprises, proceeding from the base steel outwards:

(a) an Interdiffusion layer,

(b) an Intermediate layer,

(c) an Intermetallic layer, and

(d) a Superficial layer,

wherein layers (a), (b), (c), and (d) each have a different mean composition from one another,

wherein said coating of the hot stamped coated steel product has a thickness greater than 30 micrometers.

Claim 26 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 27 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has an HV50g hardness between 290 and 410; layer (b) has an HV50g hardness between 900 and 1000, +/-10%; layer (c) has an HV50g hardness

between 580 and 650, +/-10%; and layer (d) has an HV50g harness between 900 and 1000, +/-10%.

Claim 28 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 17 micrometers or less.

Claim 29 (Previously presented) The hot stamped coated steel product according to claim 25, wherein said layer (a) has a thickness of 15 micrometers or less.

Claim 30 (Previously presented) The hot stamped coated steel product according to claim 28, wherein the coating is 40 micrometers thick.

Claim 31 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the interdiffusion layer has a first mean iron composition, the intermediate layer has a second mean iron composition less than the first mean iron composition; wherein the intermetallic layer has a third mean iron composition, the third mean iron composition less than the first mean iron composition and greater than the second mean iron composition, and the superficial layer has a fourth mean iron composition, the fourth mean iron composition begin less than the third mean iron composition.

Claim 32 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (b).

Claim 33 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (c).

Claim 34 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is greater than a thickness of layer (d).

Claim 35 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness: that is greater than a thickness of layer (b); that is greater than a thickness of layer (c); and that is greater than a thickness of layer (d).

Claim 36 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (b).

Claim 37 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (c).

Claim 38 (Previously presented) The hot stamped coated steel product according to claim 25, wherein layer (a) has a thickness that is more than twice a thickness of layer (d).

Claim 39 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product is fully martensitic.

Claim 40 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:

0.15%<carbon<0.5%;

0.5%<manganese<3%;

0.1%<silicon<0.5%;

0.01%<chromium<1%;

titanium<0.2%;

aluminum<0.1%;

phosphorus<0.1%;

sulfur<0.05%;

0.0005%<boron<0.08%;

a remainder being iron and impurities inherent in processing.

Claim 41 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the base steel consists of the following components by weight based on total weight:

0.15%<carbon<0.25%,

0.8%<manganese<1.8%,

0.1%<silicon<0.35%,

0.01%<chromium<0.5%,

titanium<0.1%

aluminum<0.1%

phosphorus<0.1%

sulfur<0.05%

0.002%<boron<0.005%,

a remainder being iron and impurities inherent in processing.

Claim 42 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Interdiffusion layer comprises the following components by weight based on total weight: 86 to 95% Fe, 4 to10% Al, and 0 to 5% Si.

Claim 43 (Previously presented) The hot stamped coated steel product according to claim 42, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 44 (Previously presented) The hot stamped coated steel product according to claim 43, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 45 (Previously presented) The hot stamped coated steel product according to claim 44, wherein the Superficial layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53to 61% Al, and 0 to 2% Si, and wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 46 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 47 (Previously presented) The hot stamped coated steel product according to claim 46, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 48 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1000 MPa.

Claim 49 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the hot stamped coated steel product has a mechanical strength in excess of 1500 MPa.

Claims 50 to 54 (Canceled).

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Application of:	ARCELORMITTAL
Inventor(s):	Drillet et al.
Application No.:	17/319,306
Filed:	May 13, 2021
Attorney Docket No.:	20631.1028CON7
Confirmation No.:	1093
Title:	Coated Steel Strips, Coated Stamped Products and Methods

Submitted electronically via EFS-Web
Mail Stop:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

February 23, 2022

RESPONSE TO NON-FINAL OFFICE ACTION

Dear Madam or Sir:

Applicant requests that the present application be reconsidered in view of the remarks that follow:

REMARKS

Claims 25-26, 28-38, and 48-49 stand rejected under 35 U.S.C. 102(b) as anticipated by Cornette et al, High Strength Steels for Automotive Safety Parts (2001), hereinafter Cornette, claims 40 and 41 stand rejected under 35 U.S.C. 103 as obvious over Cornette, and claims 27 and 42-47 stand rejected under 35 U.S.C. 103 as obvious over Cornette as applied to claim 25, in further view of US 6,296,805 to Laurent, hereinafter Laurent.

Rejection of Claims 25-26, 28-38, 48-49 Under 35 USC 102: Cornette

Initially, we note that Cornette was the subject of a 35 U.S.C. 102(b) analysis in IPR 2019-01275 of great-grandparent US 9,708,683 ('683 patent). During the IPR, the PTAB rejected the patentee's argument that the claim of the '683 patent required that the four layers be of different materials. It was based on this finding, and this finding alone, that the PTAB found the claims of the '683 patent to be anticipated:

> Patent Owner argues that we should construe the term "layer" as "a material spread over the base steel different from other materials spread over the base steel."
>
> ***
>
> Thus, the prosecution history does not support interpreting the term "layer" to require different mean compositions or different materials.
>
> Based on our review of the claim language, the Specification, and the prosecution history, we conclude that the term "layer" means "a thickness of material spread over or covering a surface."
>
> ***
>
> Having evaluated the evidence, we find that Cornette discloses the recited four-layer structure. The majority of Patent Owner's arguments are based on its claim construction of the term "layer,"—i.e., as requiring different materials—which we do not adopt.
>
> Final Written Decision, IPR2019-01275, pp. 17, 22, and 37 (Submitted in IDS of 5/17/2021)

In contrast, in the present case, independent claim 25 requires that "layers (a), (b), (c), and (d) each have a different mean composition from one another." Patentee's expert, Dr. DeArdo, has explained that Cornette does not disclose this structure:

> 124. A POSITA would have understood that Cornette provides no support that there are four different materials shown in figure 22 and Cornette does not disclose that figure 22 shows ***four different materials*** or, for that matter four different "phases/layers."
>
> 125. Cornette further does not disclose how many "phases/layers" and what materials are

present in the "hard multiphase alloy layer" of figure 22. Cornette's entire description of the "hard-multiphase alloy layer" is: Heating the pre-coated boron steel (generally 900ºC, 5 minutes) creates an alloying reaction between substrate (iron) and the coating (aluminum -silicon) which leads to a hard multiphase alloy layer. Fe-Al-Si layer is typically about 40 µm at the steel surface.
(Ex. 1013, [0009] (emphasis added)).

129. A POSITA looking at Cornette would have understood that there is ***nothing in the micrograph of figure 22 that would cause a POSITA to conclude that the purported Intermediate and Superficial layers are different material***.

130. If a POSITA were to attempt such a comparison, a POSITA looking at the micrograph in figure 22 of Cornette would have recognized that the ***alleged Superficial and Intermediate layers in figure 22 of Cornette actually appear to have the same shade and tone. Consequently, a POSITA would have recognized that the alleged Superficial and Intermediate layers in figure 22 of Cornette appear to be and certainly could be of the same material, and not different***.

132. Additionally, as explained above at paragraphs 117 and 118, the ***sample in figure 22 was not prepared to show the materials of the layers. For that reason, a POSITA could not draw any conclusions regarding the materials of the alleged layers from a simple visual inspec***tion.

133. A POSITA would have understood ***that visual inspection of figure 22 to conclude that the asserted "Superficial layer" and the asserted "Intermediate layer" are different material is similar to inspecting a black and white photograph and concluding that everyone is wearing different color clothing. Both cases are not determinable and if anything suggests that they are the same***.

134. ***A POSITA would have understood that while the same tone in Cornette figure 22 is not conclusive of the materials being the same, it certainly does not suggest that they are different***.

135. ***The alleged Superficial and Intermediate layers appear to be the same tone which, if anything, suggests that they are the same material***.

136. In contradistinction to Cornette, figure 1 and the claims of the '683 patent disclose four layers specifically described in the specification as different, having **four different mean compositions** and four different names, and not on the basis of shade, tone or color (or grayscale) and their location, but rather based on materials. (Ex 1001, 12:58-13:7). Without this compositional analysis, a POSITA would not be able to determine that layers (b) and (d) are different materials.

137. ***A POSITA looking at figure 1 of the '683 patent would have***

understood that one could not tell the difference in figure 1 of the layers based solely on appearance.

138. ***A POSITA would have understood that the alleged superficial and intermediate layers in Cornette figure 22 appear to be the same tone which, if anything, suggests that they are the same material***. A POSITA would have understood this is in contradistinction to figure 1 and the claims of the '683 patent, where the four layers are specifically described in the specification as different, having four different mean compositions and four different names, and not on the basis of shade, tone or color (or grayscale) and their location, but rather based on materials. (Ex 1001, 12:58-13:7).

139. ***A POSITA looking at the alleged Superficial and Intermediate layers in the micrograph of figure 22 of Cornette would have recognized that they appear not to be of different material at all*** and if anything a single layer because of the common shade and tone. They also appear to connect and be at least partially continuous.

140. Consequently, a POSITA would have had no basis, even if somehow figure 22 corresponded in appearance to figure 1 of the '683 patent (which it does not), to assert that the purported Intermediate layer and Superficial layers shown in figure 22 of Cornette are different materials.

141. For the reasons set forth above at paragraphs 123 to 140, a POSITA would not have been able to tell, how many purported layers are shown in figure 22 and whether the purported layers are of different materials.

142. A POSITA would not have been able to differentiate the layers in figure 22 (top) of Cornette with any certainty because of the lack of detail in the micrograph and the lack of discussion of the micrograph. A POSITA would never have made the comparison between figure 1 of the '683 patent and figure 22 of Cornette because the POSITA would not have been able to differentiate the layers in figure 22 with any certainty, there was not enough information.

Second Declaration of Dr. DeArdo (April 7, 2020) (submitted herewith in IDS).

Further, during Oral Argument, the Petitioner conceded that they had not made a showing of anticipation under Patent Owner's construction:

JUDGE ANKENBRAND: I did have a question before you actually get into the dispute about layer. I know there is a dispute on the claim construction of layer. If we agree with Patent Owner's construction for purposes of this case that a layer has to include different material, has Petitioner -- how have you made a case under that construction, or does that doom the Petition and your case?

MR. BREGMAN: I really don't want to say, "dooms our Petition". I (inaudible) --

> JUDGE ANKENBRAND: You can answer the first part of the question then. Have you made any arguments under Patent Owner's construction for why Cornette discloses four layers?
>
> MR. BREGMAN: Yes, our (inaudible) case needs to be made in the Petition, Your Honor. That was not an argument that we made in our Petition because we don't believe layer requires different compositional requirements in every layer. So part would be yes, probably doomed the Petition if you adopt that construction which we think is -- which is we think for numerous reasons is incorrect….
>
> Transcript, page 16, line 18 to page 17, line 9 (submitted herewith in IDS).

For completeness we note that the Petitioner later cited to paragraph 82 of the Miles Declaration, but that passage is in fact referring to the claim limitation in the '683 patent relating to the coating being formed by interdiffusion. *Compare* Transcript, p. 17, lines 11-22 to Declaration of Dr. Michael Miles dated June 28, 2019, paragraphs 82-86 (submitted with IDS on 5/17/2021).

For the foregoing reasons, withdrawal of the Examiner's rejection under 35 U.S.C. 102(b) of claim 25, and claims 26, 28-38, and 48-49 depending therefrom. As the rejections of remaining claims 41-47 rely on the same application of Cornette, withdrawal of the Examiner's rejection under 35 U.S.C. §103 of these claims is also requested.

Claim 31 Argued Separately

Claim 31 recites "[t]he hot stamped coated steel product according to claim 25, wherein the interdiffusion layer has a first mean iron composition, the intermediate layer has a second mean iron composition less than the first mean iron composition; wherein the intermetallic layer has a third mean iron composition, the third mean iron composition less than the first mean iron composition and greater than the second mean iron composition, and the superficial layer has a fourth mean iron composition, the fourth mean iron composition begin less than the third mean iron composition."

In support of the rejection, the Examiner states that "[t]herefore, the iron content **would be expected to decrease** within the respective layers as they are further from the substrate." (Office Action, p. 5).

Applicant respectfully points out that, accepting for purposes of argument the Examiner's contention, this in fact **establishes that claim 31 is <u>not</u> anticipated because claim 31 requires that the intermediate layer (third from the substrate) has a HIGHER iron content that the intermetallic layer (which is second from the substrate).**

Further, with regard to the Examiner's allegation that at page 4 that the process of Cornette is substantially the same as the process described in the present application, applicant responds that to the contrary the processes are quite different.

In support of the allegation that the processes are substantially the same, the Examiner alleges that Cornette describes "applying an Al-Si coating onto a steel and heating for 900° C for 5 minutes to form a 1.5 mm thick product. (See Description of Coating, Page 7 and Mechanical Characteristics, Page 8) The heating at 900° C for 5 minutes creates an alloying reaction between the substrate and coating which leads to a hard multiphase alloy layer."

However, the process described in the present specification for achieving the claimed structure includes a specific heating rate Vc between 20 and 700° C.:

> [0059] …The heating rate **Vc is comprised between 4 and 12° C./s** for producing a favorable alloyed layer disposition. In this regard, this "heating rate" reflects the temperature rise which is experienced by the pre-coated steel upon being located in the preheated furnace. **Vc is defined as the mean heating rate between 20 and 700° C**. The inventors have discovered that **the control of Vc in this precise range is a key factor, because it controls directly the nature and the morphology of the alloyed layers which are formed.** It is here underlined that **the heating rate Vc is different from the mean heating rate,** which is the heating rate between room temperature and furnace temperature.

As Cornette is entirely silent with respect to Vc, it does not perform substantially the same process as described in the present application. This is confirmed by Dr. DeArdo, who explains:

> 71. Cornette discloses precoating and heat treating a coated steel, USIBOR, to obtain high mechanical strength and corrosion protection. (Ex. 1013, at 0009). Cornette discloses that USIBOR is coated with an Al-Si coating via hot dipping, with an average coating thickness of 25μm. (Ex. 1013, at 0009). Cornette discloses that this precoated steel sheet is heated for, "generally 900ÅãC, 5 minutes," so an alloying reaction between the iron in the steel sheet and Al-Si precoating occurs, resulting in a hard Fe-Si-Al alloy layer with a thickness of "typically about 40um at the steel surface." (Ex. 1013, at [0009]). In a section of Cornette discussing mechanical characteristics of USIBOR, Cornette states that the "[M]echanical properties after hot forming process are not guarantied [sic] by USINOR." (Ex. 1013, at 0010).

> 72. Cornette does not disclose and is completely silent about any further process parameters such as a heating rate Vc or any transfer time or cooling rate. (Ex. 1013)

Withdrawal of the Examiner's rejection of claim 31 is accordingly requested on this basis as well.

Rejection of claims 40 and 41 under 35 U.S.C. 103: Cornette

Claims 40 and 41 stand rejected under 35 U.S.C. 103 as obvious over Cornette. In rejecting claims 40 and 41, the Examiner applies Cornette in the same manner as discussed above with respect to claim 25. For the reasons set forth above, Cornette does not describe a coating where "layers (a), (b), (c), and (d) each have a different mean composition from one another," and further, if anything, the color/tone structure would suggest to a person of ordinary skill in the art that at least two of the layers have the same mean composition. Withdrawal of the Examiner's rejection is accordingly requested.

Rejection of Claims 27, 42-47 under 35 U.S.C. 103: Cornette in view of Laurent.

Claims 27 and 42-47 stand rejected under 35 U.S.C. 103 as obvious over Cornette as applied to claim 25, in further view of US 6,296,805 to Laurent, hereinafter Laurent. First, inasmuch as Laurent is asserted solely for the elemental composition of the coating (Office Action, p. 7), it cannot cure the deficiencies with respect to claim 25 as described above.

In rejecting claims 27 and 42-47, the Examiner does not allege that either Cornette or Laurent discloses the limitations of these claims. Rather, in support of the rejection, the Examiner states:

> While Cornette generally teaches applying an Al-Si coating by hot dipping, it does not explicitly set forth the composition of the coating, which would then impact the compositions of the resulting layers within the coating.
>
> ***
>
> It would have been obvious to one of ordinary skill in the art to have utilized the coating of Laurent as the hot-dip coating of Cornette. One of ordinary skill in the art would have been motivated by the desire and expectation of combining prior art elements according to known method to yield predictable results, including selecting a hot-dip coating that is known for use on an overlapping composition base steel that provides the necessary corrosion protection to the base steel and has a good capacity for painting and gluing.

> The product of Cornette in view of Laurent would be expected to have the claimed composition ranges within the respective layers. **The process of producing the product of Cornette appears to be identical or substantially identical to that utilized to produce the claimed product.** In particular, Cornette teaches applying an Al-Si coating onto a steel and heating for 900 C for 5 minutes to form a 1.5 mm thick product. (See Description of Coating, Page 7 and Mechanical Characteristics, Page 8) The heating at 900 C for 5 minutes creates an alloying reaction between the substrate and coating which leads to a hard multiphase alloy layer. (Description of the coating, Page 7)

For the reasons set forth above with regard to claim 31, the process of Cornette is **not** identical or substantially identical to the process described in the present application. In particular, the present specification explains:

> [0059] … The heating rate **Vc is comprised between 4 and 12° C./s for producing a favorable alloyed layer disposition**. In this regard, this "heating rate" reflects the temperature rise which is experienced by the pre-coated steel upon being located in the preheated furnace. **Vc is defined as the mean heating rate between 20 and 700° C.** The inventors have discovered that the **control of Vc in this precise range is a key factor, because it controls directly the nature and the morphology of the alloyed layers which are formed**. It is here underlined that the **heating rate Vc is different from the mean heating rate**, which is the heating rate between room temperature and furnace temperature.

As Cornette is entirely silent with respect to Vc, it does not perform substantially the same process as described in the present application, and accordingly, there is no basis for the Examiner's allegation that the Cornette process, using the elemental composition of Laurent, would result in the claimed structure.

In particular, there is no basis to conclude that the Cornette process, using the elemental composition of Laurent, would result in "wherein layer (a) has an HV50g hardness between 290 and 410; layer (b) has an HV50g hardness between 900 and 1000, +/-10%; layer (c) has an HV50g hardness between 580 and 650, +/-10%; and layer (d) has an HV50g harness between 900 and 1000, +/-10%" as recited in claim 27.

Further, there is similarly no basis to conclude that the Cornette process, using the elemental composition of Laurent, would result in:

> Claim 42 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Interdiffusion layer comprises the following components by weight based on total weight: 86 to 95% Fe, 4 to10% Al, and 0 to 5% Si.

Claim 43 (Previously presented) The hot stamped coated steel product according to claim 42, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 44 (Previously presented) The hot stamped coated steel product according to claim 43, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Claim 45 (Previously presented) The hot stamped coated steel product according to claim 44, wherein the Superficial layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53to 61% Al, and 0 to 2% Si, and wherein said layer (a) has a thickness that is less than half of said thickness of the coating.

Claim 46 (Previously presented) The hot stamped coated steel product according to claim 25, wherein the Intermediate layer comprises the following components by weight based on total weight: 39 to 47% Fe, 53 to 61% Al, and 0 to 2% Si.

Claim 47 (Previously presented) The hot stamped coated steel product according to claim 46, wherein the Intermetallic layer comprises the following components by weight based on total weight: 62 to 67% Fe, 30 to 34% Al, and 2 to 6% Si.

Withdrawal of the Examiner's rejection of claims 27, and 42-47 is accordingly requested.

Any fees due for this response are believed to be submitted herewith by EFS. In the event that a fee is due, please charge our Deposit Account No. 50-0552.

Reconsideration and allowance of the present application is respectfully requested.

Respectfully submitted,

DAVIDSON, DAVIDSON & KAPPEL, LLC

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Sheet 1 of 1

FORM PTO-1449 (REV. 7-80)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO.	APPLICATION NO
		20631.1028CON7	17319306
LIST OF PRIOR ART CITED BY APPLICANT		APPLICANT	
		ArcelorMittal	
(Use several sheets if necessary)		FILING DATE	GROUP
		05-13-2021	1784

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	
	A01						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION	
					YES	NO
	A02					

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	A03	Second Declaration of Dr. DeArdo (April 7, 2020) submitted on April 8, 2020 in IPR 2019-01275, re US 9,708,683 B2
	A04	Record of Oral Hearing, Oral Hearing Held on October 7, 2020, Transcript, IPR 2019-01275, re US 9,708,683 B2
	A05	Declaration by Dr Grigorieva dated 09/28/2016 and curriculum vitae

EXAMINER	/Daniel J. Schleis/	DATE CONSIDERED	03/11/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with **MPEP 609**; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DJS/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	13	((PASCAL) near2 (DRILLET)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S2	8	((DOMINIQUE) near2 (SPEHNER)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S3	11	((RONALD) near2 (KEFFERSTEIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S4	0	("2013/0029172").URPN.	USPAT	OR	ON	2013/02/26 09:51
S5	9	("20030152796" | "3240269" | "5023113" | "6296805" | "6815087" | "7137201" | "7217331" | "7503116").PN. OR ("8307680").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 09:51
S6	4	("20030152796" | "5023113" | "6296805" | "7137201").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:05
S7	9	("4891274" | "5133815" | "5178688" | "5656102").PN. OR ("6296805").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:37
S8	4	("3214820" | "6197132" | "6296805").PN. OR ("7708843").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:40
S9	16	("20010042393" | "20070082214" | "20070163685" | "20090242086" | "20090308499" | "20110006491" | "20110165436" | "4546051" | "6017643" | "6093498" | "6296805" | "6298905" | "6564604" | "6815087" | "7137201" | "7867344").PN. OR ("8066829").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:40
S10	1	("2003/0152796").URPN.	USPAT	OR	ON	2013/02/26 10:43
S11	17	("1423747" | "3240269" | "4657717" | "4921159" | "5056209" | "6337471").PN. OR ("7137201").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:45
S12	10	("3632453" | "3664293" | "4751957" | "4891274" | "5518772" | "5529816").PN. OR ("6017643").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 10:47

S13	195	(("5209860") or ("8066829") or ("8066829") or ("8307680") or ("20110006491") or ("20110165436") or ("20110214475") or ("20120064362") or ("20130029172") or ("6564604") or ("20010042393") or ("20120118437") or ("4846986") or ("20120085467") or ("20080261058") or ("4601766") or ("5248528") or ("5456953") or ("5568914") or ("5830290") or ("20040118482") or ("5287983") or ("4880481") or ("4344342") or ("4963400") or ("4999241") or ("5342672") or ("5792180") or ("6070444") or ("4353765") or ("5982073") or ("6129790") or ("6165595") or ("3798406") or ("4033918") or ("4311755") or ("4488862") or ("4508755") or ("4514264") or ("4525177") or ("4551085") or ("4554765") or ("4585519") or ("4842887") or ("4994517") or ("5273369") or ("5389452") or ("5538576") or ("5542978") or ("5639510") or ("5697715") or ("5729616") or ("5801128") or ("5837314") or ("5869160") or ("6020026") or ("6019923") or ("6251514") or ("6258425") or ("6262513") or ("6309748") or ("6340397") or ("6342108") or ("20020014181") or ("20090025836") or ("20090048127") or ("4374168") or ("4309951") or ("5810332") or ("5795661") or ("8349098") or ("20020160235") or ("20020166606") or ("20100294400") or ("20110056594") or ("20110056594") or ("20120085466") or ("5981089") or ("6197125") or ("4793867") or ("4941930") or ("4980241") or ("5238506") or ("5405427") or ("5939144") or ("6090873") or ("6241393") or ("3859239") or ("3850684") or ("3850647") or ("4316751") or ("4347085") or ("4401719") or ("4402994") or ("4533606") or ("4592958") or ("4867853") or ("5232619") or ("5242506") or ("5290362") or ("5332776") or ("5466280") or ("5608028") or ("5643474") or ("5700551") or ("5743536") or	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 10:54

		("5783622") or ("5786098") or ("5851659") or ("5863640") or ("5890852") or ("5955201") or ("6001494") or ("6042949") or ("6083613") or ("6194088") or ("6197436") or ("6284059") or ("6329456") or ("6410626") or ("7533713") or ("8025965") or ("8025965") or ("20030150308") or ("20040129346") or ("20040216860") or ("20070209555") or ("20080090093") or ("20100175794") or ("20110300407") or ("20100199872") or ("4793218") or ("5584845") or ("5759304") or ("6463779") or ("7703820") or ("7926180") or ("7926180") or ("20070045384") or ("20070051434") or ("20090058111") or ("20100187291")).PN. or (("20110247467") or ("4384011") or ("5960930") or ("6120604") or ("4863650") or ("4926792") or ("4942061") or ("4035528") or ("4342418") or ("4355059") or ("4490129") or ("4611610") or ("4818570") or ("4925213") or ("5300362") or ("5728474") or ("5809628") or ("5820954") or ("6037053") or ("6132864") or ("6403192") or ("8042484") or ("20080000417") or ("20080305358") or ("20090220815") or ("20120074106") or ("20120152410") or ("4486172") or ("4537588") or ("4844327") or ("4925518") or ("7955413") or ("4283225") or ("4302515") or ("4314661") or ("4316572") or ("4358325") or ("4480016") or ("4801072") or ("4853047") or ("5018259") or ("5271318") or ("5533423") or ("5622674") or ("5660443") or ("5926516") or ("6554919") or ("6986536") or ("RE40736") or ("7955413") or ("20010049956") or ("20050285416") or ("20050285417") or ("20080257110") or ("20090173129") or ("20110266724") or ("20120120561") or ("4251549")).PN.				
S14	0	("2012/0085466").URPN.	USPAT	OR	ON	2013/02/26 10:55
S15	0	("2012/0085467").URPN.	USPAT	OR	ON	2013/02/26 10:55

S16	0	("2011/0214475").URPN.	USPAT	OR	ON	2013/02/26 10:55
S17	1	("2011/0165436").URPN.	USPAT	OR	ON	2013/02/26 10:56
S18	1	("2011/0006491").URPN.	USPAT	OR	ON	2013/02/26 10:56
S19	8,085	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 11:01
S20	2,517	S19 and (steel ferrous) same (aluminum aluminium al)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 11:02
S21	304	S20 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 11:03
S22	14	("20020068189" | "20020104876" | "20030012977" | "20030207769" | "20040028939" | "3195991" | "4957822" | "4973523" | "5112416" | "5362574" | "5384205" | "5470666" | "7074496").PN. OR ("8053087").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/02/26 12:13
S23	8,085	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/02/26 12:33
S24	286	S23 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 12:33
S25	59	S24 and (aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/02/26 12:35
S26	0	("2010/0294400").URPN.	USPAT	OR	ON	2013/02/26 12:36
S27	2	("2001/0001049").URPN.	USPAT	OR	ON	2013/02/26 12:40
S28	8,224	((428/601,600,602,653) or (420/104,120,121,126) or	US-PGPUB; USPAT; USOCR	OR	OFF	2013/09/19 16:58

		(148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.				
S29	456	S28 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:58
S30	4	S29 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:59
S31	36	S28 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2013/09/19 16:59
S32	16	("20060134451" | "20070113936" | "20070166565" | "20070246509" | "20090020276" | "20090165901" | "20100101688" | "20100112370" | "20100183897" | "20110014494" | "20110240280" | "20110287276" | "20110287277" | "5037707" | "6019939" | "7387844").PN. OR ("8247082").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 16:59
S33	0	("2010/0084057").URPN.	USPAT	OR	ON	2013/09/19 16:59
S34	13	("4673551" | "4906534" | "5037707" | "5100048").PN. OR ("6019939").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:00
S35	4	("2010/0112370").URPN.	USPAT	OR	ON	2013/09/19 17:00
S36	0	("2009/0252641").URPN.	USPAT	OR	ON	2013/09/19 17:00
S37	4	("4985196" | "4990545" | "5139832" | "6084849").PN. OR ("7060140").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:00
S38	15	("4196025" | "4309886" | "4793869" | "5507677" | "5509842" | "5618401" | "5625251" | "5629051" | "5646478").PN. OR ("5871851").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01
S39	9	("4601766" | "5019191" | "5871851").PN. OR ("6129992").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01
S40	4	("3795971" | "4455352" | "4956025").PN. OR ("5529644").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/09/19 17:01

S45	40	(("20010042393") or ("8127449") or ("7137201") or ("7708843") or ("20070163683") or ("20070175040") or ("3240269") or ("7503116") or ("7217331")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2017/03/10 08:29
S46	10	(("20010042393") or ("8127449") or ("7137201") or ("7708843") or ("20070163683") or ("20070175040") or ("3240269") or ("7503116") or ("7217331")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/03/10 08:43
S47	4	("3214820" | "6197132" | "6296805").PN. OR ("7708843").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2017/03/10 08:48
S48	8,872	((428/601,600,602,653) or (420/104,120,121,126) or (148/531,535,534,537,635,653) or (72/364,342.1,47) or (280/1)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/07/08 10:56
S49	540	S48 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 10:56
S50	13,610	(C21D9/46 or C23C2/12 or C23C2/40 or C23C2/26 or B32B15/012 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 10:58
S51	977	S50 and (interdiffusion intermediate intermetallic superficial) near3 layer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 11:00
S52	2	S51 and (strain near3 ratio)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2019/07/08 11:02
S53	15,239	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:44
S54	1,407	S53 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:45

S55	1,300	(B32B15/012).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:46
S56	167	S55 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/07/20 10:46
S57	15,511	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:40
S58	1,442	S57 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:40
S59	519	S58 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:43
S60	218	S59 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B) same (iron fe steel)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/10/29 11:43
S61	16,130	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S62	1,497	S61 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S63	551	S62 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 10:44
S64	16,130	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR;	OR	ON	2021/03/29 12:49

			EPO; JPO; DERWENT			
S65	1,497	S64 and (("uniform" "identical" "same") near5 (thickness thick))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S66	551	S65 and (aluminum aluminium al) near25 (iron fe) near25 (silicon si)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S67	231	S66 and (carbon c) same (manganese Mn) same (Silicon si) same (Chromium Cr) same (titanium ti) same (aluminum al) same (Phosphorus P) same (Sulfur Sulphur S) same (Boron B) same (iron fe steel)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/03/29 12:49
S68	0	("2021/0062288").URPN.	USPAT	OR	OFF	2021/03/29 12:55
S69	456	(("20190271058") or ("20190271056") or ("20190271055") or ("20170260603") or ("11041226") or ("10597747") or ("20190271057") or ("10577674") or ("10550447") or ("10590507") or ("20190276912") or ("10961602") or ("8307680") or ("20110165436") or ("9708683") or ("20130029172") or ("8733142") or ("8066829") or ("8440323") or ("20120064362") or ("20110214475") or ("20110006491") or ("20200263272") or ("20190153560") or ("10640842") or ("10619224") or ("10648055") or ("20190185959") or ("10669607") or ("20170268078") or ("20170016086") or ("20210214816") or ("20170298465") or ("9845518") or ("20170253941") or ("9611517") or ("8722203") or ("20100221572") or ("20140216612") or ("10131117") or ("9957582") or ("20170260599") or ("9909194") or ("20160017452") or ("20120085467") or ("9481916") or ("8721809") or ("20200399734") or ("20200190621") or ("20160289809") or ("20140212687") or ("20200385836") or ("20100026048") or ("20200149129") or ("20170341187") or ("20180100214") or ("20060130940") or ("9597750") or ("20170304952") or ("10828729") or ("10626903") or ("10480554") or ("20090220815") or ("20150152533") or	US-PGPUB; USPAT; USOCR	OR	OFF	2021/09/28 13:03

		("10626902") or ("20190285103") or ("9682443") or ("10473130") or ("20190271342") or ("20150079420") or ("20190285102") or ("20120074106") or ("20190271341") or ("10352342") or ("20200224297") or ("9669491") or ("10919117") or ("20160010174") or ("10337090") or ("20170232560") or ("20150030382") or ("9669490") or ("20140076470") or ("20160008924") or ("20180223386") or ("20140057128") or ("9157138") or ("20130136950") or ("10895003") or ("8614008") or ("20190226060") or ("20090098408") or ("10968502") or ("20210155997") or ("20210156010") or ("8435363") or ("20180202017") or ("20200277975") or ("9976205") or ("20150122377") or ("RE44940") or ("20180127855") or ("11097377") or ("10654134") or ("10780529") or ("6296805") or ("10668570") or ("9375809") or ("20160008928") or ("RE44153") or ("9676061") or ("20200001402") or ("20120138194") or ("20170120391") or ("20170266761") or ("20080075971") or ("20100043925") or ("20210162550") or ("20200016697") or ("20200165712") or ("9827633") or ("20180237877") or ("20200001403") or ("7608155") or ("20170166991") or ("20160047026") or ("11060161") or ("7708843")).PN. or (("20090238715") or ("9255313") or ("9611530") or ("10889884") or ("20080283156") or ("20140020795") or ("20210108301") or ("20180216218") or ("20090025836") or ("20180044759") or ("20190218651") or ("20210108300") or ("20180298476") or ("20200308708") or ("10612113") or ("20160017469") or ("10323307") or ("9689050") or ("20180340266") or ("10640855") or ("6564604") or ("20150147589") or ("20140134450") or ("20170335481") or ("20190226064") or ("20210032714") or ("20110174418") or ("10626478") or ("20180223409") or ("20180347018") or ("20010042393") or ("8992704") or ("20190316222") or ("10640838") or ("20140027026") or ("20200216925") or ("20200017948") or ("20210053154") or ("20190144963") or ("10287647") or ("10323292") or ("4235646") or				

("20160186298") or ("20210252579") or
("20180044774") or ("20210156012") or
("20200263283") or ("20080041501") or
("20140366997") or ("10030284") or
("10619223") or ("10253388") or
("20170314088") or ("4282044") or
("20170240991") or ("20180245173") or
("20150337408") or ("20190003029") or
("20160032439") or ("10900110") or
("10590522") or ("20150125716") or
("20160312331") or ("20140048181") or
("10822681") or ("20160215360") or
("20140366998") or ("4260419") or
("8366844") or ("20050028894") or
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("10947608") or ("20160045970") or
("10829844") or ("9616513") or
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("20090071575") or ("20140034196") or
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("20140367000") or ("20180179621") or
("6143100") or ("9605335") or
("20210087662") or ("20190127821") or
("20150044502") or ("20180237892") or
("10400315") or ("20210187906") or
("20150041024") or ("20140366999") or
("20210147953") or ("20190256942") or
("11047020") or ("20110020552") or
("10036085") or ("20200181729") or
("20210254189") or ("8309178") or
("20150191813") or ("20200232057") or
("9677145") or ("20200338857") or
("9644252") or ("20130037178") or
("4891274") or ("20150020992") or
("10471544") or ("20210087650") or
("20190309385") or ("20170080523") or
("20140230974") or ("20170137920")).PN.
or (("10119183") or ("20170145528") or
("20200094524") or ("20200156185") or
("20170321314") or ("20190185951") or
("20140261903") or ("20160002748") or
("20210140008") or ("9587298") or
("20190366686") or ("10227671") or
("20180236600") or ("8986849") or
("20170321294") or ("20200271247") or
("20210222804") or ("6294130") or
("20180117879") or ("11014195") or
("20200024708") or ("20150284861") or

		("8636854") or ("20200354807") or ("20140030544") or ("20210008665") or ("9206498") or ("3057050") or ("10246758") or ("20200353983") or ("20150360444") or ("20160010173") or ("20210107095") or ("5759306") or ("6143241") or ("20190352755") or ("10006099") or ("10704112") or ("20120237694") or ("2402834") or ("3950575") or ("20080271823") or ("20170137906") or ("4067754") or ("10253418") or ("RE31306") or ("10612107") or ("7892654") or ("20090199931") or ("20170335418") or ("20120085466") or ("6332936") or ("10131964") or ("20150010779") or ("20200385849") or ("9650692") or ("20210140021") or ("7832242") or ("20160010187") or ("10272644") or ("10428400") or ("20180148806") or ("20150044499") or ("20200071785") or ("5491036") or ("20190256937") or ("6030472") or ("20210187583") or ("20180100224") or ("20070045384") or ("20100294400") or ("10287649") or ("20150047753") or ("5616424") or ("9821858") or ("9796005") or ("4011111") or ("20110300407") or ("7959747") or ("20140120371") or ("20120073351") or ("RE31221") or ("6764558") or ("20210285067") or ("20170218471") or ("9074277") or ("20090071574") or ("10030280") or ("10577682") or ("20040035910") or ("20100282373") or ("3963531") or ("7926180") or ("8920296") or ("10961598") or ("20130220490") or ("8597443") or ("9003641") or ("20210164080") or ("20140060138") or ("2697869") or ("20100132854") or ("20170121802") or ("10174390") or ("10287440") or ("20210262075") or ("8691032") or ("7950124") or ("8597442") or ("20120177532") or ("20120006089") or ("20210277495") or ("20210115527") or ("5597656") or ("20200038998") or ("20020056492") or ("20190203311") or ("6293987") or ("8733144") or ("20170191150") or ("8048240") or ("20120225761") or ("5669436") or ("20200398377") or ("8505806") or ("7879160") or ("4917969") or ("9896736") or				

		("20070271978") or ("20080083477")).PN. or (("20160122889") or ("20120003118") or ("20070000117") or ("20200032360") or ("10385415") or ("8453482") or ("20170145529") or ("5667849") or ("20140141279") or ("7556865") or ("6923876") or ("20060108035") or ("20080289726") or ("20030121572") or ("5476725") or ("10406780") or ("20180171424") or ("20070262123") or ("6911268") or ("20160067947") or ("9790567") or ("10526677") or ("4678717") or ("20110030441") or ("20190301983") or ("4269632") or ("20170198152") or ("9512499") or ("10481052") or ("4046601") or ("5582660") or ("20130292009") or ("7442268") or ("5695822") or ("20170051372") or ("6660109") or ("10190187") or ("20050109433") or ("20040055667") or ("9598745") or ("20200407817") or ("20110232349") or ("10214792") or ("20130199676") or ("20040221929") or ("20160222486") or ("20200180077") or ("10543565") or ("20170314089") or ("9976196") or ("20200216922") or ("20030082066") or ("20120118437") or ("10773756") or ("20100282374") or ("20170183754") or ("10697052") or ("20120137502") or ("20170145533") or ("20180171459") or ("20110056594") or ("20210189517") or ("20150203932") or ("9840751") or ("10071416") or ("20180163282") or ("10053752") or ("20170145531") or ("20200063232")).PN.				
S70	445	(("8440323") or ("20120064362") or ("8733142") or ("20210262055") or ("20110006491") or ("20110214475") or ("10961602") or ("20190271056") or ("20190271057") or ("8066829") or ("20170260603") or ("20190271058") or ("20110165436") or ("20190271055") or ("8307680") or ("10550447") or ("20190276912") or ("20130029172") or ("11041226") or ("10597747") or ("10577674") or ("10590507") or ("9708683") or ("20210155997") or ("20120085467") or ("20200399734") or ("20190185959") or ("10619224") or ("20190153560") or ("10131117") or ("20170016086") or ("20200263272") or	US-PGPUB; USPAT; USOCR	OR	OFF	2021/09/28 13:05

("10640842") or ("10669607") or ("20170268078") or ("10648055") or ("20200385836") or ("20190271342") or ("20160010174") or ("20100221572") or ("20080283156") or ("20190271341") or ("20190285103") or ("20190285102") or ("20170232560") or ("7708843") or ("20140216612") or ("9669491") or ("10480554") or ("10473130") or ("10626903") or ("10352342") or ("9611517") or ("10626902") or ("8722203") or ("20170341187") or ("20090220815") or ("20200224297") or ("20120074106") or ("20160008924") or ("20170304952") or ("20180216218") or ("20140057128") or ("20150030382") or ("20160008928") or ("9669490") or ("9597750") or ("9375809") or ("9682443") or ("8614008") or ("10919117") or ("20200277975") or ("10828729") or ("20200165712") or ("10668570") or ("8721809") or ("9481916") or ("10654134") or ("20010042393") or ("20160047026") or ("20100026048") or ("20140212687") or ("9676061") or ("11097377") or ("6564604") or ("20160017452") or ("9909194") or ("20170260599") or ("20170120391") or ("9957582") or ("10780529") or ("20200149129") or ("20160237585") or ("20200001402") or ("20200016697") or ("20140134450") or ("20210162550") or ("20200001403") or ("20090025836") or ("20170335481") or ("20170266761") or ("20180340266") or ("20180223386") or ("9611530") or ("20170166991") or ("20210222804") or ("9827633") or ("20200271247") or ("11060161") or ("20210172069") or ("20180274062") or ("9677145") or ("20130037178") or ("20200308708") or ("20200038998") or ("20210108300") or ("10947608") or ("20160289809") or ("11014195") or ("20110076477") or ("20190218651") or ("20100024925") or ("20180223409") or ("20180237877") or ("20180202017") or ("10889884") or ("8481172") or ("9090951")).PN. or (("20180100214") or ("20070082214") or ("20200190621") or ("20180312955") or ("2752265") or ("20140048181") or ("20170266922") or ("20140030544") or ("8986849") or ("20210262075") or

		("20170240991") or ("20110020552") or ("20200216922") or ("20150191813") or ("20210053154") or ("20210108301") or ("20170253941") or ("8309178") or ("20170298465") or ("20150079420") or ("9644252") or ("20190085438") or ("20150368777") or ("20210214816") or ("4657787") or ("4546051") or ("9845518") or ("20210252579") or ("4287008") or ("20070209317") or ("20170145529") or ("4350539") or ("5597656") or ("10704112") or ("20160222484") or ("20170321314") or ("10081857") or ("6372346") or ("20180044799") or ("6641931") or ("20150284861") or ("20170073789") or ("20180222536") or ("4513033") or ("20100294400") or ("20040009366") or ("10287647") or ("10323292") or ("20160215360") or ("5695822") or ("RE44940") or ("4588658") or ("4528935") or ("20140076470") or ("20140366998") or ("4829655") or ("10253418") or ("6815087") or ("10030284") or ("20190376155") or ("20120118437") or ("20140366997") or ("10337090") or ("20070275264") or ("20140342181") or ("20100035080") or ("20150132603") or ("20110300407") or ("20190160507") or ("20200071808") or ("20210156010") or ("20170173734") or ("9428824") or ("20190226060") or ("20190301983") or ("20180127855") or ("20190001438") or ("20190078189") or ("20100055344") or ("20050109433") or ("20140230974") or ("4670354") or ("10968502") or ("4477291") or ("20200338856") or ("20130095345") or ("20150167131") or ("20150020930") or ("20080032161") or ("20050047955") or ("20130309410") or ("20210107095") or ("10895003") or ("20190271067") or ("10481052") or ("20200141008") or ("20030196733") or ("4257549") or ("20210107092") or ("20170137920") or ("2697869") or ("5491036") or ("20140120370") or ("10718045") or ("10119183") or ("2818360") or ("20100316805") or ("4517229") or ("20140367000") or ("20170030509") or ("20140366999") or ("9587298") or ("20100285333") or ("4666794") or ("20180079175") or ("20200017948") or				

		("20080184755") or ("6296805") or ("10131964") or ("20140120369") or ("20190368007") or ("9926620") or ("10221989") or ("20190144963") or ("20160010187") or ("9464345") or ("4285995") or ("RE44153")).PN. or (("2405662") or ("20020018909") or ("20090199934") or ("4837091") or ("20200157665") or ("10760154") or ("8475609") or ("20090098408") or ("4678717") or ("10745792") or ("20010007280") or ("4150179") or ("4542048") or ("5043230") or ("20160010173") or ("2557764") or ("20210230730") or ("20170145533") or ("20130136950") or ("20160160322") or ("20170297136") or ("20180237900") or ("20120164472") or ("20200385849") or ("10563296") or ("20070224439") or ("10801096") or ("10857619") or ("20100243192") or ("5667849") or ("20150345002") or ("5616424") or ("5789089") or ("5669436") or ("20160194739") or ("9382630") or ("10006099") or ("4235646") or ("20190226064") or ("9976196") or ("20180051366") or ("8418744") or ("20120073351") or ("20170114467") or ("10619250") or ("20200199762") or ("20050003082") or ("5476725") or ("8435363") or ("9803270") or ("20210187583") or ("3952120") or ("9284655") or ("10272644") or ("9157138") or ("20150360444") or ("20170145532") or ("6395407") or ("20210187906") or ("4401727") or ("20190003028") or ("20150013409") or ("4287009") or ("9932652") or ("10053752") or ("20110027613") or ("6036995") or ("20110030441") or ("20170253983") or ("20120135261") or ("20080075971") or ("20110017362") or ("20120085466") or ("20200063232") or ("20170260601") or ("20110174418") or ("20150079498") or ("10400315") or ("20180044774") or ("4350540") or ("20060233961") or ("9670576") or ("20170198374") or ("6585864") or ("7618677") or ("10662516") or ("20140205856") or ("20140057130") or ("20180265955") or ("20030124379") or ("20150298430") or ("9074277") or ("20150152533") or ("20120305049") or				

		("20060130940") or ("20160289802") or ("9979030") or ("20110056594") or ("6120621") or ("20200255916") or ("20100043925") or ("4571367") or ("20170246673") or ("2957782") or ("20140020795") or ("20110017361") or ("10676804") or ("20210087650") or ("9623632") or ("8453482") or ("20210114074") or ("20200353983") or ("4624895") or ("20120037140") or ("20090226755") or ("20120138194") or ("6328824") or ("10669603") or ("10731241") or ("20080271823") or ("10392686") or ("10351943") or ("20190003029") or ("20030082066") or ("3959035") or ("20150345041") or ("4282044") or ("20090311428") or ("5780172") or ("10232426")).PN. or (("6715196") or ("20170191170") or ("7608155") or ("9926619") or ("8992704") or ("20070000117") or ("5392982") or ("9540735") or ("8349098") or ("20190249271") or ("20200216925") or ("20150203952") or ("20140010968") or ("4260419") or ("20210002746") or ("4171392") or ("6332936") or ("20080041501") or ("20100307215") or ("6123999") or ("20050064215") or ("20090199931") or ("20210162454") or ("20170218471") or ("20160017469") or ("10590522") or ("8506731") or ("6660109") or ("20190078181") or ("3233312") or ("20200392614") or ("20180047998") or ("20130004794") or ("7892654") or ("20070218310") or ("10233518") or ("7981480") or ("RE29547") or ("20190040487") or ("9604311") or ("20140003860") or ("20150275044") or ("20070042205") or ("20150124401") or ("6030472") or ("7712222") or ("20100282373") or ("20140144550") or ("20070042204") or ("8361552") or ("3325282")).PN.				
S71	16,891	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/09/28 13:06
S72	414	S71 and (S69 or S70)	US-PGPUB; USPAT; USOCR	OR	OFF	2021/09/28 13:06

S73	456	(("20190271058") or ("20190271056") or ("20190271055") or ("20170260603") or ("11041226") or ("10597747") or ("20190271057") or ("10577674") or ("10550447") or ("10590507") or ("20190276912") or ("10961602") or ("8307680") or ("20110165436") or ("9708683") or ("20130029172") or ("8733142") or ("8066829") or ("8440323") or ("20120064362") or ("20110214475") or ("20110006491") or ("20200263272") or ("20190153560") or ("10640842") or ("10619224") or ("10648055") or ("20190185959") or ("10669607") or ("20170268078") or ("20170016086") or ("20210214816") or ("20170298465") or ("9845518") or ("20170253941") or ("9611517") or ("8722203") or ("20100221572") or ("20140216612") or ("10131117") or ("9957582") or ("20170260599") or ("9909194") or ("20160017452") or ("20120085467") or ("9481916") or ("8721809") or ("20200399734") or ("20200190621") or ("20160289809") or ("20140212687") or ("20200385836") or ("20100026048") or ("20200149129") or ("20170341187") or ("20180100214") or ("20060130940") or ("9597750") or ("20170304952") or ("10828729") or ("10626903") or ("10480554") or ("20090220815") or ("20150152533") or ("10626902") or ("20190285103") or ("9682443") or ("10473130") or ("20190271342") or ("20150079420") or ("20190285102") or ("20120074106") or ("20190271341") or ("10352342") or ("20200224297") or ("9669491") or ("10919117") or ("20160010174") or ("10337090") or ("20170232560") or ("20150030382") or ("9669490") or ("20140076470") or ("20160008924") or ("20180223386") or ("20140057128") or ("9157138") or ("20130136950") or ("10895003") or ("8614008") or ("20190226060") or ("20090098408") or ("10968502") or ("20210155997") or ("20210156010") or ("8435363") or ("20180202017") or ("20200277975") or ("9976205") or ("20150122377") or ("RE44940") or ("20180127855") or ("11097377") or ("10654134") or ("10780529") or ("6296805") or	US-PGPUB; USPAT; USOCR	OR	OFF	2022/03/11 13:11

("10668570") or ("9375809") or ("20160008928") or ("RE44153") or ("9676061") or ("20200001402") or ("20120138194") or ("20170120391") or ("20170266761") or ("20080075971") or ("20100043925") or ("20210162550") or ("20200016697") or ("20200165712") or ("9827633") or ("20180237877") or ("20200001403") or ("7608155") or ("20170166991") or ("20160047026") or ("11060161") or ("7708843")).PN. or (("20090238715") or ("9255313") or ("9611530") or ("10889884") or ("20080283156") or ("20140020795") or ("20210108301") or ("20180216218") or ("20090025836") or ("20180044759") or ("20190218651") or ("20210108300") or ("20180298476") or ("20200308708") or ("10612113") or ("20160017469") or ("10323307") or ("9689050") or ("20180340266") or ("10640855") or ("6564604") or ("20150147589") or ("20140134450") or ("20170335481") or ("20190226064") or ("20210032714") or ("20110174418") or ("10626478") or ("20180223409") or ("20180347018") or ("20010042393") or ("8992704") or ("20190316222") or ("10640838") or ("20140027026") or ("20200216925") or ("20200017948") or ("20210053154") or ("20190144963") or ("10287647") or ("10323292") or ("4235646") or ("20160186298") or ("20210252579") or ("20180044774") or ("20210156012") or ("20200263283") or ("20080041501") or ("20140366997") or ("10030284") or ("10619223") or ("10253388") or ("20170314088") or ("4282044") or ("20170240991") or ("20180245173") or ("20150337408") or ("20190003029") or ("20160032439") or ("10900110") or ("10590522") or ("20150125716") or ("20160312331") or ("20140048181") or ("10822681") or ("20160215360") or ("20140366998") or ("4260419") or ("8366844") or ("20050028894") or ("20160222484") or ("11021776") or ("10519525") or ("20210198774") or ("20180127857") or ("20120018059") or ("10947608") or ("20160045970") or ("10829844") or ("9616513") or ("10273552") or ("20170073789") or ("20180274062") or ("20150020930") or

		("20160194739") or ("8337643") or ("20090071575") or ("20140034196") or ("20150034215") or ("9926620") or ("20180222536") or ("20160237585") or ("20140367000") or ("20180179621") or ("6143100") or ("9605335") or ("20210087662") or ("20190127821") or ("20150044502") or ("20180237892") or ("10400315") or ("20210187906") or ("20150041024") or ("20140366999") or ("20210147953") or ("20190256942") or ("11047020") or ("20110020552") or ("10036085") or ("20200181729") or ("20210254189") or ("8309178") or ("20150191813") or ("20200232057") or ("9677145") or ("20200338857") or ("9644252") or ("20130037178") or ("4891274") or ("20150020992") or ("10471544") or ("20210087650") or ("20190309385") or ("20170080523") or ("20140230974") or ("20170137920")).PN. or (("10119183") or ("20170145528") or ("20200094524") or ("20200156185") or ("20170321314") or ("20190185951") or ("20140261903") or ("20160002748") or ("20210140008") or ("9587298") or ("20190366686") or ("10227671") or ("20180236600") or ("8986849") or ("20170321294") or ("20200271247") or ("20210222804") or ("6294130") or ("20180117879") or ("11014195") or ("20200024708") or ("20150284861") or ("8636854") or ("20200354807") or ("20140030544") or ("20210008665") or ("9206498") or ("3057050") or ("10246758") or ("20200353983") or ("20150360444") or ("20160010173") or ("20210107095") or ("5759306") or ("6143241") or ("20190352755") or ("10006099") or ("10704112") or ("20120237694") or ("2402834") or ("3950575") or ("20080271823") or ("20170137906") or ("4067754") or ("10253418") or ("RE31306") or ("10612107") or ("7892654") or ("20090199931") or ("20170335418") or ("20120085466") or ("6332936") or ("10131964") or ("20150010779") or ("20200385849") or ("9650692") or ("20210140021") or ("7832242") or ("20160010187") or ("10272644") or ("10428400") or ("20180148806") or ("20150044499") or ("20200071785") or				

		("5491036") or ("20190256937") or ("6030472") or ("20210187583") or ("20180100224") or ("20070045384") or ("20100294400") or ("10287649") or ("20150047753") or ("5616424") or ("9821858") or ("9796005") or ("4011111") or ("20110300407") or ("7959747") or ("20140120371") or ("20120073351") or ("RE31221") or ("6764558") or ("20210285067") or ("20170218471") or ("9074277") or ("20090071574") or ("10030280") or ("10577682") or ("20040035910") or ("20100282373") or ("3963531") or ("7926180") or ("8920296") or ("10961598") or ("20130220490") or ("8597443") or ("9003641") or ("20210164080") or ("20140060138") or ("2697869") or ("20100132854") or ("20170121802") or ("10174390") or ("10287440") or ("20210262075") or ("8691032") or ("7950124") or ("8597442") or ("20120177532") or ("20120006089") or ("20210277495") or ("20210115527") or ("5597656") or ("20200038998") or ("20020056492") or ("20190203311") or ("6293987") or ("8733144") or ("20170191150") or ("8048240") or ("20120225761") or ("5669436") or ("20200398377") or ("8505806") or ("7879160") or ("4917969") or ("9896736") or ("20070271978") or ("20080083477")).PN. or (("20160122889") or ("20120003118") or ("20070000117") or ("20200032360") or ("10385415") or ("8453482") or ("20170145529") or ("5667849") or ("20140141279") or ("7556865") or ("6923876") or ("20060108035") or ("20080289726") or ("20030121572") or ("5476725") or ("10406780") or ("20180171424") or ("20070262123") or ("6911268") or ("20160067947") or ("9790567") or ("10526677") or ("4678717") or ("20110030441") or ("20190301983") or ("4269632") or ("20170198152") or ("9512499") or ("10481052") or ("4046601") or ("5582660") or ("20130292009") or ("7442268") or ("5695822") or ("20170051372") or ("6660109") or ("10190187") or ("20050109433") or ("20040055667") or ("9598745") or				

		("20200407817") or ("20110232349") or ("10214792") or ("20130199676") or ("20040221929") or ("20160222486") or ("20200180077") or ("10543565") or ("20170314089") or ("9976196") or ("20200216922") or ("20030082066") or ("20120118437") or ("10773756") or ("20100282374") or ("20170183754") or ("10697052") or ("20120137502") or ("20170145533") or ("20180171459") or ("20110056594") or ("20210189517") or ("20150203932") or ("9840751") or ("10071416") or ("20180163282") or ("10053752") or ("20170145531") or ("20200063232")).PN.				
S74	445	(("8440323") or ("20120064362") or ("8733142") or ("20210262055") or ("20110006491") or ("20110214475") or ("10961602") or ("20190271056") or ("20190271057") or ("8066829") or ("20170260603") or ("20190271058") or ("20110165436") or ("20190271055") or ("8307680") or ("10550447") or ("20190276912") or ("20130029172") or ("11041226") or ("10597747") or ("10577674") or ("10590507") or ("9708683") or ("20210155997") or ("20120085467") or ("20200399734") or ("20190185959") or ("10619224") or ("20190153560") or ("10131117") or ("20170016086") or ("20200263272") or ("10640842") or ("10669607") or ("20170268078") or ("10648055") or ("20200385836") or ("20190271342") or ("20160010174") or ("20100221572") or ("20080283156") or ("20190271341") or ("20190285103") or ("20190285102") or ("20170232560") or ("7708843") or ("20140216612") or ("9669491") or ("10480554") or ("10473130") or ("10626903") or ("10352342") or ("9611517") or ("10626902") or ("8722203") or ("20170341187") or ("20090220815") or ("20200224297") or ("20120074106") or ("20160008924") or ("20170304952") or ("20180216218") or ("20140057128") or ("20150030382") or ("20160008928") or ("9669490") or ("9597750") or ("9375809") or ("9682443") or ("8614008") or ("10919117") or ("20200277975") or ("10828729") or ("20200165712") or	US-PGPUB; USPAT; USOCR	OR	OFF	2022/03/11 13:11

		("10668570") or ("8721809") or ("9481916") or ("10654134") or ("20010042393") or ("20160047026") or ("20100026048") or ("20140212687") or ("9676061") or ("11097377") or ("6564604") or ("20160017452") or ("9909194") or ("20170260599") or ("20170120391") or ("9957582") or ("10780529") or ("20200149129") or ("20160237585") or ("20200001402") or ("20200016697") or ("20140134450") or ("20210162550") or ("20200001403") or ("20090025836") or ("20170335481") or ("20170266761") or ("20180340266") or ("20180223386") or ("9611530") or ("20170166991") or ("20210222804") or ("9827633") or ("20200271247") or ("11060161") or ("20210172069") or ("20180274062") or ("9677145") or ("20130037178") or ("20200308708") or ("20200038998") or ("20210108300") or ("10947608") or ("20160289809") or ("11014195") or ("20110076477") or ("20190218651") or ("20100024925") or ("20180223409") or ("20180237877") or ("20180202017") or ("10889884") or ("8481172") or ("9090951")).PN. or (("20180100214") or ("20070082214") or ("20200190621") or ("20180312955") or ("2752265") or ("20140048181") or ("20170266922") or ("20140030544") or ("8986849") or ("20210262075") or ("20170240991") or ("20110020552") or ("20200216922") or ("20150191813") or ("20210053154") or ("20210108301") or ("20170253941") or ("8309178") or ("20170298465") or ("20150079420") or ("9644252") or ("20190085438") or ("20150368777") or ("20210214816") or ("4657787") or ("4546051") or ("9845518") or ("20210252579") or ("4287008") or ("20070209317") or ("20170145529") or ("4350539") or ("5597656") or ("10704112") or ("20160222484") or ("20170321314") or ("10081857") or ("6372346") or ("20180044799") or ("6641931") or ("20150284861") or ("20170073789") or ("20180222536") or ("4513033") or ("20100294400") or ("20040009366") or ("10287647") or ("10323292") or ("20160215360") or ("5695822") or ("RE44940") or ("4588658") or				

		("4528935") or ("20140076470") or ("20140366998") or ("4829655") or ("10253418") or ("6815087") or ("10030284") or ("20190376155") or ("20120118437") or ("20140366997") or ("10337090") or ("20070275264") or ("20140342181") or ("20100035080") or ("20150132603") or ("20110300407") or ("20190160507") or ("20200071808") or ("20210156010") or ("20170173734") or ("9428824") or ("20190226060") or ("20190301983") or ("20180127855") or ("20190001438") or ("20190078189") or ("20100055344") or ("20050109433") or ("20140230974") or ("4670354") or ("10968502") or ("4477291") or ("20200338856") or ("20130095345") or ("20150167131") or ("20150020930") or ("20080032161") or ("20050047955") or ("20130309410") or ("20210107095") or ("10895003") or ("20190271067") or ("10481052") or ("20200141008") or ("20030196733") or ("4257549") or ("20210107092") or ("20170137920") or ("2697869") or ("5491036") or ("20140120370") or ("10718045") or ("10119183") or ("2818360") or ("20100316805") or ("4517229") or ("20140367000") or ("20170030509") or ("20140366999") or ("9587298") or ("20100285333") or ("4666794") or ("20180079175") or ("20200017948") or ("20080184755") or ("6296805") or ("10131964") or ("20140120369") or ("20190368007") or ("9926620") or ("10221989") or ("20190144963") or ("20160010187") or ("9464345") or ("4285995") or ("RE44153")).PN. or (("2405662") or ("20020018909") or ("20090199934") or ("4837091") or ("20200157665") or ("10760154") or ("8475609") or ("20090098408") or ("4678717") or ("10745792") or ("20010007280") or ("4150179") or ("4542048") or ("5043230") or ("20160010173") or ("2557764") or ("20210230730") or ("20170145533") or ("20130136950") or ("20160160322") or ("20170297136") or ("20180237900") or ("20120164472") or ("20200385849") or ("10563296") or ("20070224439") or ("10801096") or ("10857619") or ("20100243192") or ("5667849") or				

		("20150345002") or ("5616424") or ("5789089") or ("5669436") or ("20160194739") or ("9382630") or ("10006099") or ("4235646") or ("20190226064") or ("9976196") or ("20180051366") or ("8418744") or ("20120073351") or ("20170114467") or ("10619250") or ("20200199762") or ("20050003082") or ("5476725") or ("8435363") or ("9803270") or ("20210187583") or ("3952120") or ("9284655") or ("10272644") or ("9157138") or ("20150360444") or ("20170145532") or ("6395407") or ("20210187906") or ("4401727") or ("20190003028") or ("20150013409") or ("4287009") or ("9932652") or ("10053752") or ("20110027613") or ("6036995") or ("20110030441") or ("20170253983") or ("20120135261") or ("20080075971") or ("20110017362") or ("20120085466") or ("20200063232") or ("20170260601") or ("20110174418") or ("20150079498") or ("10400315") or ("20180044774") or ("4350540") or ("20060233961") or ("9670576") or ("20170198374") or ("6585864") or ("7618677") or ("10662516") or ("20140205856") or ("20140057130") or ("20180265955") or ("20030124379") or ("20150298430") or ("9074277") or ("20150152533") or ("20120305049") or ("20060130940") or ("20160289802") or ("9979030") or ("20110056594") or ("6120621") or ("20200255916") or ("20100043925") or ("4571367") or ("20170246673") or ("2957782") or ("20140020795") or ("20110017361") or ("10676804") or ("20210087650") or ("9623632") or ("8453482") or ("20210114074") or ("20200353983") or ("4624895") or ("20120037140") or ("20090226755") or ("20120138194") or ("6328824") or ("10669603") or ("10731241") or ("20080271823") or ("10392686") or ("10351943") or ("20190003029") or ("20030082066") or ("3959035") or ("20150345041") or ("4282044") or ("20090311428") or ("5780172") or ("10232426")).PN. or (("6715196") or ("20170191170") or ("7608155") or ("9926619") or ("8992704") or ("20070000117") or				

		("5392982") or ("9540735") or ("8349098") or ("20190249271") or ("20200216925") or ("20150203952") or ("20140010968") or ("4260419") or ("20210002746") or ("4171392") or ("6332936") or ("20080041501") or ("20100307215") or ("6123999") or ("20050064215") or ("20090199931") or ("20210162454") or ("20170218471") or ("20160017469") or ("10590522") or ("8506731") or ("6660109") or ("20190078181") or ("3233312") or ("20200392614") or ("20180047998") or ("20130004794") or ("7892654") or ("20070218310") or ("10233518") or ("7981480") or ("RE29547") or ("20190040487") or ("9604311") or ("20140003860") or ("20150275044") or ("20070042205") or ("20150124401") or ("6030472") or ("7712222") or ("20100282373") or ("20140144550") or ("20070042204") or ("8361552") or ("3325282")).PN.				
S75	17,695	(C21D9/46 or B32B15/012 or C23C2/12 or C23C2/26 or C23C2/40 or Y10T428/12389 or Y10T428/12396 or Y10T428/12757).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2022/03/11 13:11
S76	414	S75 and (S73 or S74)	US-PGPUB; USPAT; USOCR	OR	OFF	2022/03/11 13:11
S77	37	(("8440323") or ("20120064362") or ("8733142") or ("20210262055") or ("20110006491") or ("20110214475") or ("10961602") or ("20190271057") or ("20190271056") or ("8066829") or ("20220002834") or ("20170260603") or ("20190271058") or ("20110165436") or ("20190271055") or ("10550447") or ("8307680") or ("20190276912") or ("20130029172") or ("11041226") or ("10597747") or ("10577674") or ("10590507") or ("9708683") or ("20210301364") or ("20210155997") or ("20120085467") or ("20200399734") or ("11248276") or ("20190185959") or ("10619224") or ("20190153560") or ("10131117") or ("20170016086") or ("20200263272") or ("10640842") or ("10669607")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2022/03/11 13:14

S78	46	(("20190271058") or ("20190271056") or ("20220002834") or ("20190271055") or ("20170260603") or ("11041226") or ("10597747") or ("20190271057") or ("10577674") or ("10550447") or ("10590507") or ("20190276912") or ("10961602") or ("8307680") or ("20110165436") or ("9708683") or ("20130029172") or ("8733142") or ("8066829") or ("8440323") or ("20120064362") or ("20110214475") or ("20110006491") or ("20200263272") or ("20190153560") or ("10640842") or ("10619224") or ("20190185959") or ("10648055") or ("10669607") or ("20210301364") or ("20170268078") or ("20170016086") or ("10131117") or ("9957582") or ("20170260599") or ("9909194") or ("20120085467") or ("20160017452") or ("20210214816") or ("9611517") or ("8722203") or ("20100221572") or ("20140216612") or ("20170298465") or ("9845518")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2022/03/11 13:16

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S41	5,246	(C21D9/46 B32B15/012 C23C2/12 C23C2/26 C23C2/40 Y10T428/12389 Y10T428/12396 Y10T428/12757).cpc.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S42	1,776	S41 and (aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S43	888	S41 and ((aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)).clm.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:46
S44	136	S43 and ((interdiffusion intermediate intermetallic superficial) near3 layer).clm.	US-PGPUB; USPAT	OR	ON	2016/12/02 11:47
S79	9,013	(C21D9/46 B32B15/012 C23C2/12 C23C2/26 C23C2/40 Y10T428/12389 Y10T428/12396 Y10T428/12757).cpc.	US-PGPUB; USPAT	OR	ON	2022/03/11 13:32
S80	1,588	S79 and ((aluminum aluminium al) near5 (pre-coat$4 precoat$4 layer coat$5)).clm.	US-PGPUB; USPAT	OR	ON	2022/03/11 13:32
S81	239	S80 and ((interdiffusion intermediate intermetallic superficial) near3 layer).clm.	US-PGPUB; USPAT	OR	ON	2022/03/11 13:32

3/11/2022 2:12:10 PM
C:\Users\dschleis\Documents\EAST\Workspaces\17319306.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

Search Notes		
Search Notes	**Date**	**Examiner**
Inventor Name Search	09/28/2021	Schleis
Assignee Name Search	09/28/2021	Schleis
Reviewed Global Dossier	09/28/2021	Schleis
Reviewed File Wrapper of Related Family Applications	09/28/2021	Schleis
Reviewed IPR2019-01275 Proceedings	09/28/2021	Schleis
STN Search	09/28/2021	Schleis
IP.COM Search	09/28/2021	Schleis
EAST Text Search	09/28/2021	Schleis
Reviewed File Wrapper of Related Family Applications	03/11/2022	Schleis
IP.COM Search	03/11/2022	Schleis
EAST Text Search	03/11/2022	Schleis
Reviewed Global Dossier	03/11/2022	Schleis

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
C21D	9/46	03/11/2022	Schleis
B32B	15/012	03/11/2022	Schleis
C23C	2/12, 2/26, 2/40	03/11/2022	Schleis
Y10T	428/12389, 42812396, 428/12757	03/11/2022	Schleis

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

23280 7590 03/22/2022

Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

EXAMINER	
SCHLEIS, DANIEL J	
ART UNIT	PAPER NUMBER
1784	

DATE MAILED: 03/22/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

TITLE OF INVENTION: Coated Steel Strips, Coated Stamped Products and Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/22/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23280 7590 03/22/2022
Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

TITLE OF INVENTION: Coated Steel Strips, Coated Stamped Products and Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/22/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
SCHLEIS, DANIEL J	1784	428-601000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

23280 7590 03/22/2022

Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

EXAMINER	
SCHLEIS, DANIEL J	

ART UNIT	PAPER NUMBER
1784	

DATE MAILED: 03/22/2022

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/319,306	Applicant(s) DRILLET et al.	
	Examiner Daniel J Schleis	Art Unit 1784	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to response filed 02/23/22.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 25-49 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 11/29/21, 02/23/22.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Daniel J. Schleis/
Primary Examiner, Art Unit 1784

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:

In view of the arguments asserts by applicant in the remarks submitted on 23 February 2022, the previous prior art rejections have been withdrawn. The Office is unable to determine if the materials within the respective layers of the prior art are different materials through a visual examination of the figures provided in the prior art. Additionally, the previously applied prior art is silent on the Vc, as asserted by applicant.

Therefore, a search of the prior art failed to turn up a single reference or an appropriate combination of multiple references that sets forth each and every claimed limitation.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J Schleis whose telephone number is (571)270-5636. The examiner can normally be reached 10 AM to 4 PM Monday through Friday.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Humera Sheikh can be reached on (571) 272-0604. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel J. Schleis
Primary Examiner
Art Unit 1784

/Daniel J. Schleis/
Primary Examiner, Art Unit 1784

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/11/2022								
1	25	=								
2	26	=								
3	27	=								
4	28	=								
5	29	=								
6	30	=								
7	31	=								
8	32	=								
9	33	=								
10	34	=								
11	35	=								
12	36	=								
13	37	=								
14	38	=								
15	39	=								
16	40	=								
17	41	=								
18	42	=								
19	43	=								
20	44	=								
21	45	=								
22	46	=								
23	47	=								
24	48	=								
25	49	=								

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

CPC						
Symbol					Type	Version
C21D	/	9	/	46	F	2013-01-01
B32B	/	15	/	012	I	2013-01-01
C23C	/	2	/	12	I	2013-01-01
C23C	/	2	/	26	I	2013-01-01
C23C	/	2	/	40	I	2013-01-01
Y10T	/	428	/	12389	A	2015-01-15
Y10T	/	428	/	12396	A	2015-01-15
Y10T	/	428	/	12757	A	2015-01-15

CPC Combination Sets								
Symbol					Type	Set	Ranking	Version
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/Daniel J. Schleis/ Primary Examiner, Art Unit 1784	11 March 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	25	1

U.S. Patent and Trademark Office — Part of Paper No.: 20220311

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

INTERNATIONAL CLASSIFICATION					
CLAIMED					
B32B	/	15	/	01	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
428	601

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/Daniel J. Schleis/ Primary Examiner, Art Unit 1784	11 March 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	25	1

U.S. Patent and Trademark Office — Part of Paper No.: 20220311

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/319,306	DRILLET et al.
	Examiner	Art Unit
	Daniel J Schleis	1784

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	25	10	34	19	43										
2	26	11	35	20	44										
3	27	12	36	21	45										
4	28	13	37	22	46										
5	29	14	38	23	47										
6	30	15	39	24	48										
7	31	16	40	25	49										
8	32	17	41												
9	33	18	42												

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	25	
/Daniel J. Schleis/ Primary Examiner, Art Unit 1784	11 March 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	25	1

U.S. Patent and Trademark Office Part of Paper No.: 20220311

17319306 - 03112022

Report Run Date: 2022-03-11 UTC
Searches: 2
Markers: 0

Search #	Timestamp	Results	Page
1	2022-03-11 18:12 UTC	30,744,529	3
2	2022-03-11 18:15 UTC	31,842,369	4

A **Content: Patent Publications (164)**

US Patents | US Designs | US Applications | EPO Patents | EPO Applications | China Patents | China Applications | Japan Patents | Japan Applications | Korea Patents | Korea Applications | WIPO Applications | Argentina Patents | Argentina Applications | Brazil Patents | Brazil Applications | Canada Patents | Canada Applications | Chile Patents | Chile Applications | Colombia Applications | Costa Rica Applications | Cuba Patents | Cuba Applications | Dominican Republic Applications | Ecuador Patents | Ecuador Applications | El Salvador Applications | Guatemala Applications | Honduras Applications | Mexico Patents | Mexico Applications | Nicaragua Patents | Panama Applications | Peru Applications | Trinidad & Tobago Patents | Uruguay Applications | Austria Patents | Austria Applications | Belarus Patents | Belgium Patents | Belgium Applications | Bosnia & Herzegovina Patents | Bosnia & Herzegovina Applications | Bulgaria Patents | Bulgaria Applications | Croatia Patents | Croatia Applications | Czech Republic Patents | Czech Republic Applications | Czechoslovakia Patents | Czechoslovakia Applications | Denmark Patents | Denmark Applications | Estonia Patents | Estonia Applications | EUIPO Patents | Finland Patents | Finland Applications | France Patents | France Applications | Germany Patents | Germany Applications | Great Britain Patents | Great Britain Applications | Greece Patents | Greece Applications | Hungary Patents | Hungary Applications | Iceland Patents | Iceland Applications | Ireland Patents | Ireland Applications | Italy Patents | Italy Applications | Latvia Patents | Latvia Applications | Lithuania Patents | Lithuania Applications | Luxembourg Patents | Malta Patents | Monaco Patents | Montenegro Patents | Montenegro Applications | Netherlands Patents | Netherlands Applications | Norway Patents | Norway Applications | Poland Patents | Poland Applications | Portugal Patents | Portugal Applications | Republic of Moldova Patents | Republic of Moldova Applications | Romania Patents | Romania Applications | San Marino Patents | San Marino Applications | Serbia Patents | Serbia Applications | Slovakia Patents | Slovakia Applications | Slovenia Patents | Spain Patents | Spain Applications | Sweden Patents | Sweden Applications | Switzerland Patents | Switzerland Applications | Ukraine Patents | Yugoslavia/Serbia and Montenegro Patents | Yugoslavia/Serbia and Montenegro Applications | Armenia Patents | Australia Patents | Australia Applications | Cyprus Patents | Gulf Cooperation Council Patents | Hong Kong Patents | India Patents | India Applications | Indonesia Patents | Indonesia Applications | Israel Applications | Jordan Patents | Kyrgyzstan Patents | Macao Applications | Malaysia Patents | Mongolia Patents | New Zealand Patents | Philippines Patents | Philippines Applications | Saudi Arabia Patents | Singapore Patents | Singapore Applications | Taiwan Patents | Taiwan Applications | Tajikistan Patents | Tajikistan Applications | Thailand Applications | Uzbekistan Patents | Vietnam Patents | Algeria Patents | ARIPO Patents | ARIPO Applications | Egypt Patents | Kenya Patents | Malawi Patents | Morocco Patents | Morocco Applications | OAPI Patents | South Africa Patents | Tunisia Applications | Zambia Patents | Zimbabwe Patents | EAPO Patents | EAPO Applications | Georgia Patents | Georgia Applications | Kazakhstan Patents | Kazakhstan Applications | Russia Patents | Russia Applications | Turkey Patents | Turkey Applications

1 **2022-03-11 18:12 UTC | 30,744,529 results from** **A**

De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Text

A hot stamped coated steel product, which comprises: (a) a strip of base steel having a first side and a second side; and (b) a coating on at least one of said first side of said strip of base steel and said second side of said strip of base steel, wherein: (i) said coating results from interdiffusion between said base steel and an aluminum or aluminum alloy pre-coating, and (ii) wherein said coating comprises, proceeding from the base steel outwards: (a) an interdiffusion layer, (b) an intermediate layer, (c) an intermetallic layer, and (d) a Superficial layer, wherein layers (a), (b), (c), and (d) each have a different mean composition from one another, wherein said coating of the hot stamped coated steel product has a thickness greater than 30 micrometers.

Concept Modifiers: None

Filters: None

2 **2022-03-11 18:15 UTC | 31,842,369 results from**

De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Document

US20210262055 Coated Steel Strips, Coated Stamped Products and Methods (view)

Concept Modifiers: None

Filters: None

Sheet 1 of 1

FORM PTO-1449 (REV. 7-80)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. 20631.1028CON7	APPLICATION NO 17319306
LIST OF PRIOR ART CITED BY APPLICANT		APPLICANT ArcelorMittal	
(Use several sheets if necessary)		FILING DATE 05-13-2021	GROUP 1784

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	
	A01						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION	
					YES	NO
	A02					

OTHER REFERENCES *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	A03	Influence of Hot Deformation On Continuous Cooling Bainitic Transformation in a Low Carbon Steel", Z. D. Wang et al., Acta Metallurgica Sinica, Vol. 11, No. 2, pp 121-127, April 1998
	A04	"Various characteristics of aluminum-coated steel sheet for hot pressing", Masayoshi Suehiro et al., Nippon Steel Technical Report, No. 378 (2003), pages 15-20, see English Abstract
	A05	The high-temperature oxidation behavior of hot-dipping Al-Si coating on low carbon steel", Chaur-Jeng Wang et al., Surface & Coatings Technology 200 (2006) 6601-6605
	A06	Etude thermo-mécanique et modélisation numérique de l' emboutissage à chaud de l'Usibor 1500, Lucia Garcia Aranda, the cover, the table of contents, pages 1-15, 40-51, 82 and 104-106 see machine translation
	A07	New Practical Hardware Manual, edited by JIAN Guangyi, China Electric Power Press, first edition and first printing in August 2005, the title page, the copyright information page, the preface, the table of contents, page 43, see partial translation
	A08	Basis for Material Science, edited by ZHAO Pin et al., Harbin Institute of Technology Press, first edition and first printing in August 1999, the title page, the copyright information page, the preface, the foreword, the table of contents, page 177- 178
	A09	Isothermal Transformation Curve of Steel, edited by Yang Kegong, Heilongjiang People's Publishing House, first edition and first printing in August 1981, the title page, the copyright information page, the preface, the table of contents and partial translation
	A10	Heat Treatment of Iron and Steel—Principle and Application, editing group of the Heat Treatment of Iron and Steel, Shanghai Scientific and Technical Publishers, first edition and first printing in January 1979, the title page, the copyright information page, the preface, the table of contents, pages 20-23 and partial translation
	A11	Heat-Assisted Forming Theory for Sheet Metals, edited by MIN Junying et al, Tongji University Press, first edition and first printing in August 2014, the title page, the copyright information page, the preface, the table of contents, page 70 and partial translation
	A12	Basic Investigations on the Hot Stamping Steel 22MnB5", M.Geiger et al., Advanced Materials Research, Vols 6-8 (May 2005) pp.795-802
	A13	Translation of Fundamentals of Material Science, PAN Jinsheng et al., Tsinghua University Press, first edition in June 1998 and fourth printing in August 2003, the cover, the title page, the copyright information page, the catalogue, pages 593-597

EXAMINER	/Daniel J. Schleis/	DATE CONSIDERED	03/11/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DJS/

Electronic Patent Application Fee Transmittal				
Application Number:	17319306			
Filing Date:	13-May-2021			
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods			
First Named Inventor/Applicant Name:	Pascal DRILLET			
Filer:	William C. Gehris/Simon Steiner			
Attorney Docket Number:	20631.1028CON7			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	1200

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23280 7590 03/22/2022
Davidson, Davidson & Kappel, LLC
589 8th Avenue
22nd Floor
New York, NY 10018

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

Simon Steiner	(Typed or printed name)
/Simon Steiner/	(Signature)
April 4, 2022	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/13/2021	Pascal DRILLET	20631.1028CON7	1093

TITLE OF INVENTION: Coated Steel Strips, Coated Stamped Products and Methods

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	06/22/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
SCHLEIS, DANIEL J	1784	428-601000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Davidson, Davidson & Kappel, LLC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ArcelorMittal

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Luxembourg, Luxembourg

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ☑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 500552

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /williamcgehris/ Date April 4, 2022

Typed or printed name William C. Gehris Registration No. 38156

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Electronic Acknowledgement Receipt	
EFS ID:	45386791
Application Number:	17319306
International Application Number:	
Confirmation Number:	1093
Title of Invention:	Coated Steel Strips, Coated Stamped Products and Methods
First Named Inventor/Applicant Name:	Pascal DRILLET
Customer Number:	23280
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1	Issue Fee Payment (PTO-85B)	IssueFees.PDF	97760	no	1
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	17319306
Filing Date	2021-05-13
First Named Inventor	Pascal DRILLET
Art Unit	
Examiner Name	
Attorney Docket Number	20631.1028CON7

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5116645	A	1992-05-26	~~ARMCO STEEL CO LP~~ Boston et al.	
Change(s) applied to document, /J.T/ 4/6/2022	2	4257549	A	1981-03-24	~~ROBERTSON CO H H~~ Bricmont	
	3	5495736	A	1996-03-05	Nishi et al.	

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	1	20020114884	A1	2002-08-22	FRIEDERSDORF FRITZ J et al.	

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	1	19749706	DE	C1	1999-03-04	MANNESMANN AG	See English Abstract and EPO machine translation	

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DJS/

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/319,306	05/10/2022	11326227	20631.1028CON7	1093

23280 7590 04/20/2022

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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

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IR103 (Rev. 10/09)