

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

**0 347 512
A1**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 88830267.6

(51) Int. Cl.⁴: **C21D 9/38 , C22C 38/24 ,
C22C 38/26 , C22C 38/28 ,
C21D 6/00**

(22) Date of filing: 23.06.88

(43) Date of publication of application:
27.12.89 Bulletin 89/52

(64) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **INNSE CILINDRI S.r.l.**
Piazza Piccapietra, 9
I-16121 Genova(IT)

(72) Inventor: **Camplani, Ferruccio**
Via Salvo D'Acquisto, 20
I-25100 Brescia(IT)

(74) Representative: **Vannini, Torquato et al**
JACOBACCI-CASETTA & PERANI S.p.A. 7 Via
Visconti di Modrone
I-20122 Milan(IT)

(54) **A bimetal construction roll for reducing and finishing stands in a rolling mill train.**

(57) In a bimetal construction roll for reducing and finishing stands in a rolling mill train, the table is composed of an alloy comprising 1% to 2% carbon, 8% to 16% chromium, and secondary and tertiary metallic carbides of at least one element selected from the group including vanadium, niobium, and titanium; a table such as this performs well both with respect to wear and thermal fatigue, and retains the surface shape characteristics unaltered.

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This invention relates to a bimetal construction roll for reducing and finishing stands in a rolling mill train, being of a type having a table formed from an alloy including 1% to 2% carbon and 8% to 16% chromium.

In relation to bimetallic steel rolls in reducing and finishing stands for hot rolling strip and sheet metal, the need is particularly felt to prevent formation of hard oxide deposits from the rolled, which phenomenon is better known by the term "banding", to control both the amount and the type of the oxides which form on the surface of the roll tables, and to minimize the occurrence of wear, thermal fatigue, and cracking phenomena which affect the tables. In fact, all of the above-noted phenomena contribute toward deteriorating the roll tables so as to shorten their life and lower their performance; also for these reasons, the rolled product may lack uniformity and fall short of the expected quality levels.

To meet such demands, it is known to use bimetallic rolls the tables whereof are formed from an alloy having a carbon content within the range of 0.9% to 1.9%, a chromium content within 6% to 15%, and molybdenum additions which may be as high as 5%.

While being on the whole satisfactory in the respect of the banding phenomenon, resistance to thermal fatigue and to wear, such conventional bimetallic rolls exhibit the well-recognized drawback of their tables being prone to undergo surface deformation, such as in the form of wrinkles.

The problem that underlies this invention is to provide a bimetal construction roll of the type specified above, which has such structural and operational features as to overcome the cited drawback affecting the prior art.

This problem is solved according to the invention by a bimetal construction roll as indicated being characterized in that metallic carbides of at least one element from the group comprising vanadium, niobium, and titanium are present in said alloy.

Further features and the advantages of a bimetal construction roll of steel according to the invention will be apparent from the following detailed description of a preferred embodiment given herein below by way of illustrative example and not of limitation. A bimetal construction roll of steel for reducing and finishing stands in a hot rolling mill train comprises a table formed from an alloy which includes 1% to 2% carbon and 8% to 16% chromium.

Advantageously present in the alloy are metallic carbides of at least one element selected from the group including vanadium, niobium, and titanium, provided therein to a proportion between 0.20% and 4%.

In accordance with a preferred embodiment of this invention, the table is formed from an alloy steel, specifically an alloy including, additionally to iron, the following composition of alloying elements:

C	Si	Mn	Cr	Ni	Mo	V
1.5	.8	.8	12	.5	3.5	1

Shown in the following table is the composition of another exemplary alloy for a bimetal construction roll table according to this invention:

C	Si	Mn	Cr	Ni	Mo	Nb	Ti
1.8	.8	.8	12	.5	3.5	1	.5

Advantageously, the table of the bimetallic roll for rolling mills according to this invention is subjected to the following heat treatment steps:

austenitization at temperatures in the 950° to 1050° C range;

hardening in either still or blown air, with the cooling rate set to suit the roll size, and a pause followed by homogenizing at about 500° C; and

two-step tempering to convert the residual austenite, at temperatures in the 450° to 550° C range to be selected according to the hardness sought.

It is to be noted that in the aforesaid alloy there are present vanadium, niobium, and titanium, which elements are sure to trigger, in the course of the heat treatment, formation of the so-called secondary and tertiary metallic carbides, which will precipitate during the hardening step and the tempering steps, respectively.

The above-noted secondary and tertiary metallic carbides will form within the grain, and practically constitute actual anchoring points, to impart the grain with superior hardness and resistance.

Additional elements, such as molybdenum, are provided in the alloy whose content is determined in a

manner known per se contingent on individual specific requirements.

The bimetal construction roll of this invention has tested successfully as regards wear, thermal fatigue, and the banding phenomenon, while affording the added advantage of retaining the table shape characteristics unaltered as a result of the presence of secondary and tertiary vanadium, niobium, and titanium metallic
 5 carbides. In fact, these carbides affect the table deformability at working temperatures and impart a high resistance to hot plastic state flowing, thereby preventing surface deformation of the table. The net result is that the bimetal construction rolls according to the invention yield high quality rolled products.

10 Claims

1. A bimetal construction roll for reducing and finishing stands in a rolling mill train, being of a type having a table formed from an alloy including 1% to 2% carbon and 8% to 16% chromium, and characterized in that metallic carbides of at least one element from the group comprising vanadium,
 15 niobium, and titanium are present in said alloy.

2. A bimetal construction roll according to Claim 1, characterized in that it comprises metallic carbides of at least one element selected from the vanadium, niobium, and titanium group as caused to precipitate by means of a heat treatment process including a hardening step and at least one tempering step.

3. A bimetal construction roll according to Claim 2, characterized in that it comprises secondary metallic
 20 carbides as precipitated by means of said hardening step.

4. A bimetal construction roll according to Claim 2, characterized in that it comprises tertiary metallic carbides as precipitated by means of said at least one tempering step.

5. A bimetal construction roll according to Claim 1, characterized in that said at least one element selected from the vanadium, niobium, and titanium group is present in said alloy in amounts ranging from
 25 0.2% to 4%.

6. A bimetal construction roll according to Claim 1, characterized in that in said alloy there are present metallic vanadium carbides as precipitated by means of a heat treatment process including a hardening step and at least one tempering step, wherein vanadium is in the amount of 1%, said alloy being substantially austenite-free.

7. A bimetal construction roll according to Claim 1, characterized in that in said alloy there are present
 30 metallic carbides of niobium and titanium as precipitated by means of a heat treatment process including a hardening step and at least one tempering step, wherein niobium and titanium are in the respective amounts of 1% and 0.5%, said alloy being substantially austenite-free.

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08-02-1989	Examiner ASHLEY G.W.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			



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Place of search THE HAGUE		Date of completion of the search 08-02-1989	Examiner ASHLEY G.W.
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