

(19)



(11)

EP 1 423 219 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.10.2008 Bulletin 2008/41

(51) Int Cl.:
B21D 31/04^(2006.01) C21D 7/10^(2006.01)

(21) Application number: **02765741.0**

(86) International application number:
PCT/SE2002/001577

(22) Date of filing: **04.09.2002**

(87) International publication number:
WO 2003/020456 (13.03.2003 Gazette 2003/11)

(54) **A METHOD FOR MANUFACTURING AN ULTRA-HIGH-TENSILE, EXPANDED METAL OF STEEL**

VERFAHREN ZUR HERSTELLUNG EINES ULTRAHOCHZUGFESTEN STRECKMETALLS AUS
STAHL

PROCEDE DE FABRICATION DE FEUILLE DE METAL EXPANSEE DE RESISTANCE TRES ELEVEE

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**

(30) Priority: **05.09.2001 SE 0102943**

(43) Date of publication of application:
02.06.2004 Bulletin 2004/23

(73) Proprietor: **Outokumpu Oyj
02200 Espoo (FI)**

(72) Inventors:
• **CARLSSON, Leif
S-465 91 Nossebro (SE)**
• **GROTH, Hans
S-774 61 Avesta (SE)**

(74) Representative: **Rosenquist, Per Olof et al
Bergenstrahle & Lindvall AB,
P.O. Box 17704
118 93 Stockholm (SE)**

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Description

[0001] The present invention relates to a method for manufacturing an ultra-high-tensile expanded metal of steel.

[0002] When manufacturing an expanded metal one usually starts from metallic work pieces, preferably of soft steel with good forming properties. During the forming operation one achieves a certain degree of deformation hardening, which however is insufficient for obtaining an ultra-high-tensile final product. In case one should start from a material that initially is ultra-high-tensile with a yield point preferably more than 700 MPa, this material would not have sufficient ductility to be formed to expanded metal. This is so because the material would break during the forming operation.

[0003] US 2,018,085 disclose a method of making expanded metal of stainless steel. The work piece is plastically treated, by conventional methods, in order to form the expanded metal, whereupon the material becomes deformation hardened. In the method according to US 2,018,085, there are attempts to avoid deformation hardening.

[0004] The object of the present invention is to provide a method for manufacturing an ultra-high-tensile expanded metal, which is constituted of iron that has been alloyed to give a strong deformation hardening when being subjected to plastic cold machining in combination with maintaining good ductility of the alloy at the same time as the final product achieves a yield point more than 700 MPa. These objects can be achieved by a method according to claim 1.

[0005] Thanks to the invention one has now provided a method for manufacturing an ultra-high-tensile expanded metal of steel, which in an excellent manner fulfils its object at the same time as the manufacture can take place very rationally with already existing machines to low cost.

[0006] The invention is described in more detail with the aid of the embodiment below.

[0007] In a preferred embodiment of the invention, the expanded metal manufactured according to the invention is constituted of a work piece of iron, which has been alloyed with chromium, nickel and carbon in predetermined proportions. In the example chosen the iron is alloyed with 17% Cr, 7% Ni and 0,1% C or alloys closely related to these and that the temperature of the work piece before and/or during the manufacturing operation has achieved or is kept at a controlled level, wherein a strong but controlled deformation hardening is achieved when plastic cold working the work piece in combination with maintaining a good ductility of the alloy. Furthermore, the temperature of the finally formed expanded metal is controlled after the working operation. The alloyed metal work piece that forms the initial work piece is formed in traditional machines for expanded metal fabrication to increase its yield point from an original, low yield point of about 300 MPa to a final product that com-

pletely or partially obtains a yield point of more than 700 MPa.

Claims

1. A method for manufacturing an ultra-high-tensile expanded metal of steel, in which method the initial work piece used and constituted of a metal work piece of iron alloyed with chromium, nickel and carbon in predetermined proportions, **characterized in that** the initial metal work piece is plastically cold worked to provide a strong deformation hardening that gives the final product a strong, many times increased strength or yield point, as compared to the yield point of the initial work piece, which original low yield point is about 300 MPa and the higher one is more than 700 MPa, whereby the initial work piece is cooled to or is kept at a controlled temperature before and during the forming operation to obtain a controlled, maximal strength independently of the degree of deformation during the forming operation.
2. A method according to claim 1, **characterized in that** the work piece consisting of iron that is plastically worked is alloyed with 17% Cr, 7% Ni and 0,1% C or closely related alloys.
3. A method according to claim 1 or 2, **characterized in that** the temperature to which the work piece has been cooled or the temperature that is maintained during the forming operation is about $-196 \leq T \leq 70^\circ\text{C}$.
4. A method according to any of the preceding claims, **characterized in that** the final product is cooled or is kept at a controlled temperature to obtain a controlled maximal strength independently of the degree of deformation during the forming operation.
5. A method according to claim 4, **characterized in that** the temperature to which the final product is cooled or the temperature that is maintained after the forming operation is about $-196 \leq T \leq 70^\circ\text{C}$.
6. A method according to claim 1, **characterized in that** the alloyed work piece is formed in traditional machines for manufacturing expanded metals to increase its yield point from an original low yield point to a final product that completely or partially obtains a higher yield point.

Patentansprüche

1. Verfahren zur Herstellung eines ultrahochzügfesten Streckmetalls aus Stahl, wobei in dem Verfahren ein Ausgangswerkstück verwendet wird, welches aus einem Metallwerkstück aus Eisen besteht, das mit

Chrom, Nickel und Kohlenstoff in vorbestimmten Anteilen legiert ist, **dadurch gekennzeichnet, dass** das Ausgangswerkstück aus Metall plastisch kalt-, verformt wird, um eine starke Verformungshärtung zu bewirken, welche dem Endprodukt eine hohe, im Vergleich mit der Streckgrenze des Ausgangswerkstücks um ein Vielfaches erhöhte Festigkeit oder Streckgrenze zu vermitteln, wobei die ursprüngliche niedrige Streckgrenze ungefähr 300 MPa und die höhere mehr als 700 MPa beträgt, wobei das Ausgangswerkstück vor und während des Formvorgangs auf eine kontrollierte Temperatur gekühlt oder auf dieser gehalten wird, um eine kontrollierte, maximale Festigkeit unabhängig von dem Grad der Verformung während des Formvorgangs zu erhalten.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das plastisch verformte Werkstück aus Eisen, das mit 17% Cr, 7% Ni und 0,1 % C legiert ist, oder diesem nahekommenden Legierungen besteht.
3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Temperatur, auf welche das Werkstück gekühlt wird, oder die Temperatur, die während des Formvorgangs beibehalten wird, ungefähr $-196 \leq T \leq 70^\circ\text{C}$ beträgt.
4. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Endprodukt gekühlt oder bei einer kontrollierten Temperatur gehalten wird, um eine maximale Festigkeit unabhängig von dem Grad der Verformung während des Formvorgangs zu erhalten.
5. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** die Temperatur, auf welche das Endprodukt gekühlt wird, oder die Temperatur, die nach dem Formvorgang gehalten wird, ungefähr $-196 \leq T \leq 70^\circ\text{C}$ beträgt.
6. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das legierte Werkstück in herkömmlichen Maschinen zur Herstellung von Streckmetallen geformt wird, um seine Streckgrenze von einer ursprünglichen, niedrigen Streckgrenze bis zu einem Endprodukt zu erhöhen, dem vollständig oder teilweise eine höhere Streckgrenze vermittelt wird.

usiner metallique initiale est travaillée à froid par déformation plastique pour fournir un important durcissement de déformation qui confère au produit final une importante, résistance accrue plusieurs fois ou limite apparente d'élasticité, comparée à la limite apparente d'élasticité de la pièce à usiner initiale, dont la faible limite apparente d'élasticité initiale est d'environ 300 MPa et la plus élevée est supérieure à 700 MPa, de cette façon la pièce à usiner initiale est refroidie ou est maintenue à une température contrôlée avant et pendant l'opération de formation pour obtenir une résistance maximale, contrôlée indépendamment du degré de déformation pendant l'opération de formation.

2. Procédé selon la revendication 1, **caractérisé en ce que** la pièce à usiner constituée de fer qui est travaillée par déformation plastique est alliée avec 17% de chrome, 7% de nickel et 0,1 % de carbone ou d'alliages étroitement liés.
3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** la température à laquelle la pièce à usiner a été refroidie ou la température qui est maintenue pendant l'opération de formation est environ $-196 \leq T \leq 70^\circ\text{C}$.
4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le produit final est refroidi ou est maintenu à une température contrôlée pour obtenir une résistance maximale contrôlée indépendamment du degré de déformation pendant l'opération de formation.
5. Procédé selon la revendication 4, **caractérisé en ce que** la température à laquelle le produit final est refroidi ou la température qui est maintenue après l'opération de formation est environ $-196 \leq T \leq 70^\circ\text{C}$.
6. Procédé selon la revendication 1, **caractérisé en ce que** la pièce à usiner alliée est formée dans des machines traditionnelles de fabrication de métaux expansés pour augmenter sa limite apparente d'élasticité d'une faible limite apparente d'élasticité initiale à un produit final qui obtient complètement ou partiellement une limite apparente d'élasticité supérieure.

Revendications

1. Procédé de fabrication de feuille de métal expansé de résistance très élevée, dans lequel procédé la pièce à usiner initiale utilisée et constituée d'une pièce à usiner métallique ferreuse alliée avec du chrome, du nickel et du carbone dans des proportions prédéterminées, **caractérisé en ce que** la pièce à

REFERENCES CITED IN THE DESCRIPTION

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