

Title (en)  
HOLLOW MEMBER AND METHOD FOR MANUFACTURING SAME

Title (de)  
HOHLKÖRPER UND VERFAHREN ZU SEINER HERSTELLUNG

Title (fr)  
ÉLÉMENT CREUX ET PROCÉDÉ POUR SA FABRICATION

Publication  
**EP 2239343 A4 20160615 (EN)**

Application  
**EP 09703762 A 20090120**

Priority  
• JP 2009051148 W 20090120  
• JP 2008010018 A 20080121

Abstract (en)  
[origin: EP2239343A1] A method for manufacturing a hollow article having excellent durability is provided. In particular, an electric resistance welded steel pipe which is made from a steel sheet and in which the width of a low carbon layer is 2h (m) is subjected to a heat treatment that includes a quenching treatment in which the electric resistance welded steel pipe is heated to a heating temperature T (K) not lower than the Ac 3 transformation temperature at a heating rate V h (K/s), held for a soaking time k (s), immediately cooled to a quenching start temperature Tq (K) at a primary cooling rate V c (K/s), and then secondarily cooled (quenched). The heating rate V h, the maximum heating temperature T, and the primary cooling rate V c are adjusted so as to satisfy an inequality (herein C 0 (mass percent) is the C content (mass percent) of the steel sheet, t is the diffusion time (s),  $t = 50 / V h + 50 / V c + k$ , V h is the heating rate (K/s), V c is the primary cooling rate (K/s), k is the soaking time (s), D is the diffusion coefficient (m<sup>2</sup>/s),  $D (m^2/s) = D_0 \exp(-Q / RT)$ ,  $D_0$  is  $4.7 \times 10^{-5}$  (m<sup>2</sup>/s), Q = 155 (kJ/mol·K), R = 8.31 (J/mol·K), and T is the maximum heating temperature (K)) and the quenching start temperature Tq is higher than the Ar 3 transformation temperature. This prevents the hardness as quenching of the electric resistance welded portion from being reduced and significantly increases the durability of the heat-treated article.  $0.83 \# \frac{1}{1 - 0.09 / C_0} - h \exp - y \frac{2}{4} \# \frac{Dt}{4} \# \frac{\Delta T}{\# dy}$

IPC 8 full level  
**C21D 9/08** (2006.01); **C21D 1/25** (2006.01); **C21D 9/50** (2006.01); **C22C 1/00** (2006.01); **C22C 38/00** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/06** (2006.01); **C22C 38/14** (2006.01); **C22C 38/58** (2006.01)

CPC (source: EP KR)  
**C21D 1/25** (2013.01 - EP KR); **C21D 9/08** (2013.01 - EP KR); **C21D 9/50** (2013.01 - EP KR); **C22C 1/11** (2023.01 - EP KR); **C22C 38/001** (2013.01 - EP KR); **C22C 38/002** (2013.01 - KR); **C22C 38/02** (2013.01 - EP KR); **C22C 38/04** (2013.01 - EP KR); **C22C 38/06** (2013.01 - EP KR); **C22C 38/14** (2013.01 - EP KR); **C21D 2211/008** (2013.01 - EP KR)

Citation (search report)  
• [XP] WO 2008105216 A1 20080904 - JFE STEEL CORP [JP], et al & EP 2116623 A1 20091111 - JFE STEEL CORP [JP]  
• [A] JP 2006206999 A 20060810 - JFE STEEL KK  
• See references of WO 2009093728A1

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