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(21) International Application Number: PCT/US99/18419 (22) International Filing Date: 12 August 1999 (12.08.99) (30) Priority Data: 09/133,158 12 August 1998 (12.08.98) US (71) Applicant (for all designated States except US): SWAGELOK COMPANY [US/US]; 29500 Solon Road, Solon, OH 44139 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): WILLIAMS, Peter, C. [US/US]; 3495 Edison Road, Cleveland Heights, OH 44118 (US). MARX, Steven, V. [US/US]; 2439 S. Belvoir Boulevard, University ts., OH 44118 (US). (74) Agent: GUTT, Ronald, D.; Calfee, Halter & Griswold LLP, Suite 1400, 800 Superior Avenue, Cleveland, OH 44114 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 27 July 2000 (27.07.00)
(54) Title: SELECTIVE CASE HARDENING PROCESSES AT LOW TEMPERATURE (57) Abstract A selectively case hardened steel article by low temperature carburization includes a body made of a chromium bearing nickel or ferrous based alloy (for example, stainless steel), a first portion of the body having a first hardness characteristic, and a second portion of the body having a second hardness characteristic; the second portion being less than the entire body and substantially free of carbides. One method for selective case hardening by low temperature carburization includes the steps of applying a carbon blocking mask over surface areas of the article that are not going to be carburized; activating those surface areas that are to be carburized; diffusing carbon into the activated surface areas at a temperature below which carbides readily form; and removing the carbon blocking mask.		

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/18419

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C23C8/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 344 817 A (JOHN M. CONNARD) 3 October 1967 (1967-10-03) column 2, line 61 - line 64 column 3, line 10 - line 12; claims 1,3	1-27
Y	EP 0 678 589 A (DAIDO HOXAN INC.) 25 October 1995 (1995-10-25) page 3, line 36 - line 39 , sentence 54 - sentence 58 page 4, line 45 -page 5, line 2; claims 1,4,6,8,9	1-27



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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15 May 2000

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Intl. Patent Application No PCT/US 99/18419

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE WPI Section Ch, Week 197618 Derwent Publications Ltd., London, GB; Class M13, AN 1976-31988X XP002137714 & DD 117 893 A (SOBE G), 5 February 1976 (1976-02-05) abstract ----	1,12,23
A	US 3 408 237 A (JOHN T. GULLIKSEN) 29 October 1968 (1968-10-29) claims 1,2; figures 1-3 -----	1,3,12, 23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/18419

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3344817	A	03-10-1967	NONE
EP 678589	A	25-10-1995	CN 1121118 A 24-04-1996 CN 1115791 A 31-01-1996 DE 69510719 D 19-08-1999 DE 69510719 T 09-12-1999 JP 3005952 B 07-02-2000 JP 8158035 A 18-06-1996 US 5556483 A 17-09-1996 US 5593510 A 14-01-1997
DD 117893	A	05-02-1976	NONE
US 3408237	A	29-10-1968	DE 1262731 B FR 1437944 A 27-07-1966 GB 1087184 A NL 6508150 A 31-12-1965 SE 327878 B 31-08-1970