(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 189 550 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
26.05.2010 Bulletin 2010/21

(21) Application number: **08783992.4**

(22) Date of filing: **15.08.2008**

(51) Int Cl.:
C22C 38/58 *(2006.01)*

(86) International application number:
PCT/CN2008/072001

(87) International publication number:
WO 2009/024069 (26.02.2009 Gazette 2009/09)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **15.08.2007 CN 200710146759**

(71) Applicant: **Jin, Baofeng**
Jiangxi 334000 (CN)

(72) Inventors:
- **JIN, Rong**
  Shangrao
  Jiangxi 334000 (CN)
- **JIN, Yuan**
  Shangrao
  Jiangxi 334000 (CN)

(74) Representative: **Hatzmann, Martin et al**
Vereenigde
Johan de Wittlaan 7
2517 JR Den Haag (NL)

(54) **A Fe ALLOY**

(57) The present invention discloses a ferroalloy which is composed of 0.01-0.26wt% of C, 0.08-1.00wt% of Si, 4.50-12.00wt% of Mn, 0.02-0.2wt% of P, 0.025-0.06wt% of S, 3.50-22.00wt% of Ni, 15.00-24.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy. The ferroalloy has explosion proof and no-spark properties, thus is suitable for the application in the explosion proof and no-spark field and especially suitable for producing containers for dangerous chemicals, emergency rescue apparatus and related tools.

EP 2 189 550 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a ferroalloy, and more specifically to a ferroalloy material which is sparkless under impaction and friction and explosion proof.

BACKGROUND

[0002] No-spark metal materials in the prior art are mainly copper alloys. However, apparatus and tools made of no-spark copper alloys tend to exhibit inferior hardness, resulting in dramatically shortened service life and high operating costs, which has impeded the development of the industry for a long time.

[0003] A ferroalloy is disclosed in Chinese Patent Application No. 85103868, which is composed of 2.00-3.25wt% of C, 0.40-1.2wt% of Mn, 0.40-0.90wt% of Si, 0.70-1.50wt% of Cr, 0.60-1.2wt% of B, 0.05wt% or less of P, 0.05wt% or less of S and the balance being Fe to sum up to 100wt%, in which the contents of P and S are kept as low as possible.

[0004] A hard and wear resistant ferroalloy is disclosed in Chinese Patent Application No. 86102537, which is composed of 2.50-3.00wt% of C, 0.50-1.30wt% of Mn, 0.30-1.3wt% of Si, 25.0-30.0wt% of Cr, 3.90-4.75wt% of Ni, 2.0-2.5wt% of Mo, 0.05wt% or less of P, 0.05wt% or less of S, 0.4-1.0wt% of V, 3.0-4.0wt% of B and the balance being Fe to sum up to 100%.

[0005] Both of the ferroalloys mentioned in the above two patent application documents have superior hardness and a wear resistance, but they tend to produce sparks during the incidents of impaction and friction, rendering them unsuitable for application in the explosion proof and sparkless field.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is to provides a ferroalloy being both sparkless under impaction and friction and explosion proof, which meets the criterions hold by the manufacturers of emergency rescue apparatus used for the case of leakage of dangerous chemicals from metal containers and manufacturers of metal containers for dangerous chemicals and is suitable for the application in the no-spark and explosion proof field.

[0007] In order to achieve the above-said object, the present invention provides a ferroalloy which is composed of 0.01-0.26wt% of C, 0.08-1.00wt% of Si, 4.50-12.00wt% of Mn, 0.02-0.2wt% of P, 0.02-0.06wt% of S, 3.50-22.00wt% ofNi, 15.00-24.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

[0008] In an embodiment of the present invention, the ferroalloy is composed of 0.15-0.18wt% of C, 0.085-0.09wt% of Si, 5.00-8.00wt% of Mn, 0.03-0.05wt% of P, 0.02-0.025wt% of S, 17.00-19.00wt% ofNi, 16.00-18.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

[0009] In an embodiment of the present invention, the ferroalloy is composed of 0.18wt% of C, 0.09wt% of Si, 8.00wt% of Mn, 0.05wt% of P, 0.02wt% of S, 19.00wt% of Ni, 18.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy; or

the ferroalloy is composed of 0.15wt% of C, 0.085wt% of Si, 5.00wt% of Mn, 0.03wt% of P, 0.025wt% of S, 17.00wt% ofNi, 16.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

[0010] In an embodiment of the present invention, the ferroalloy further comprises 0.05-6.00wt% of Mo.

[0011] In an embodiment of the present invention, the ferroalloy is composed of 0.020-0.08wt% of C, 0.09-1.00wt% of Si, 9.00-11.00wt% of Mn, 0.08-0.15wt% of P, 0.035-0.045wt% of S, 9.50-21.00wt% of Ni, 19.00-22.00wt% of Cr, 0.06-0.10wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

[0012] In an embodiment of the present invention, the ferroalloy is composed of
0.04wt% of C, 1.00wt% of Si, 11.00wt% of Mn, 0.10wt% of P, 0.035wt% of S, 12.00wt% of Ni, 22.00wt% of Cr, 0.06wt% of Mo and the balance of Fe, based on the weight of said ferroalloy; or
0.020wt% of C, 0.09wt% of Si, 10.00wt% of Mn, 0.08wt% of P, 0.035wt% of S, 21.00wt% of Ni, 22.00wt% of Cr, 0.10wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

[0013] In an embodiment of the present invention, the ferroalloy is composed of 0.08wt% of C, 0.095wt% of Si, 9.00wt% of Mn, 0.15wt% of P, 0.045wt% of S, 9.50wt% of Ni, 19.00wt% of Cr, 0.09wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

[0014] In an embodiment of the present invention, the ferroalloy further comprises 0.01-4.00wt% of Cu, 0.01-0.22wt% ofN and the balance of Fe.

[0015] In an embodiment of the present invention, the ferroalloy is composed of 0.012-0.017wt% of C, 0.08-0.085wt% of Si, 7.50-12.00wt% of Mn, 0.02wt% of P, 0.025wt% of S, 15.00-20.00wt% of Ni, 17.00-22.00wt% of Cr, 0.05-2.00wt% of Mo, 0.09-0.12wt% of Cu, 0.09-0.12wt% of N and the balance of Fe, based on the weight of said ferroalloy.

[0016] In an embodiment of the present invention, the ferroalloy is composed of

0.012wt% of C, 0.08wt% of Si, 12.00wt% of Mn, 0.02wt% of P, 0.025wt% of S, 20.00wt% of Ni, 22.00wt% of Cr, 0.05wt% of Mo, 0.12wt% of Cu, 0.12wt% of N and the balance of Fe; or
0.017wt% of C, 0.085wt% of Si, 7.50wt% of Mn, 0.02wt% of P, 0.025wt% of S, 15.00wt% of Ni, 17.00wt% of Cr, 2.00wt% of Mo, 0.09wt% of Cu, 0.09wt% of N and the balance of Fe.

[0017] When compared with the prior art ones, the ferroalloy of the present invention is both sparkless under impaction and friction and explosion proof. Said ferroalloy can be used for manufacturing metal containers for dangerous chemicals, thus avoiding occurrence of serious accidents caused by leakage of dangerous chemicals therefrom due to the rupture of the containers under incidental impaction and friction during the transporting and handling. Said ferroalloy can also be used in the manufacture of emergency rescue apparatus which, when used for the incident of leakage of dangerous chemicals, will not bring about any spark even if impaction or friction between the apparatus and the metal containers happens, thus avoiding the risk of deteriorating the serious accidents while securing safety and effectiveness of the emergency rescue. The ferroalloy of the present invention is also suitable for application in the explosion proof and no spark field.

BEST EMBODIMENTS OF THE INVENTION

Example 1:

[0018] Steel raw material containing required components of C, Mn, Si, S and P was mixed with Ni and Cr under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.15wt% of C, 5.0wt% of Mn, 0.085wt% of Si, 0.03wt% of P, 0.025wt% of S, 17.00wt% of Ni, 16.00wt% of Cr and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 2:

[0019] Steel raw material containing required components of C, Mn, Si, S and P was mixed with Ni and Cr under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.18wt% of C, 8.00wt% of Mn, 0.09wt% of Si, 0.05wt% of P, 0.02wt% of S, 19.0wt% of Ni, 18.00wt% of Cr and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 3:

[0020] Steel raw material containing required components of C, Mn, Si, S and P was mixed with Ni, Cr and Mo under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.08wt% of C, 10.00wt% of Mn, 0.09wt% of Si, 0.08wt% of P, 0.035wt% of S, 21.00wt% of Ni, 18.00wt% of Cr, 0.10wt% of Mo and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 4:

[0021] Steel raw material containing required components of C, Mn, Si, S and P was mixed with Ni, Cr and Mo under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.04wt% of C, 11.00wt% of Mn, 1.00wt% of Si, 0.10wt% of P, 0.035wt% of S, 12.00wt% of Ni, 22.00wt% of Cr, 0.06wt% of Mo and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 5:

[0022] Steel raw material containing required components of C, Mn, Si, S and P was mixed with Ni, Cr and Mo under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.02wt% of C, 9.00wt% of Mn, 0.095wt% of Si, 0.15wt% of P, 0.045wt% of S, 9.50wt% of Ni, 19.00wt% of Cr, 0.09wt% of Mo and the balance of Fe. The ferroalloy was cast into different sections, which were

processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 6:

[0023] Steel raw material containing required components of C, Mn, Si, S, P, Cu and N was mixed with Ni, Cr and Mo under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.017wt% of C, 7.50wt% of Mn, 0.085wt% of Si, 0.02wt% of P, 0.025wt% of S, 15.00wt% of Ni, 17.00wt% of Cr, 2.00wt% of Mo, 0.09wt% of Cu, 0.09wt% of N and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 7:

[0024] Steel raw material containing required components of C, Mn, Si, S, P, Cu and N was mixed with Ni, Cr and Mo under required quantities and then heated to melt so as to obtain the following chemical composition, which is determined by sampling and analysis: 0.012wt% of C, 12.00wt% of Mn, 0.08wt% of Si, 0.02wt% of P, 0.025wt% of S, 20.00wt% of Ni, 22.00wt% of Cr, 0.05wt% of Pt, 0.12wt% of Cu , 0.12wt% of N and the balance of Fe. The ferroalloy was cast into different sections, which were processed and machined into metal containers for dangerous chemicals and emergency rescue apparatus as well as other tools. Their performances are shown in example 8.

Example 8:

(A) Samples were made of alloys of examples 1-7 and their explosion proof properties were measured.

[0025] Testing Method
Explosion proof properties were measured according to GB 10686-89, ***Testing Method for Explosion Proof Properties of Tools Made of Copper Alloys.***

(1) Free Falling Hammer Test

[0026] The free falling hammer tests were conducted according to the standard of GB 10686.
[0027] Test Temperature: 16 °C; Humidity: 40% RH(relative humidity); Atmospheric Pressure: 100kPa
Sample Gauge: 60(diameter) × 30mm
Number of Samples: three blocks
Mass of Hammer: 14 kg
Testing Gas: a mixture of methane and air
Concentration of Testing Gas: 6.0-7.0 %
Distance from Hammer to Falling Point: 4m
Angle between the Steel Sheet to be impacted and the Horizontal Plane: 45 degree.
[0028] Process of Test: the falling and impacting tests are performed by using a 14kg hammer from a height of 4m for 32 times.
[0029] Standard of Test: No explosion in all of the 32 falling and impacting tests was taken as being qualified.

(2) Rotational Friction Test

[0030] The rotational friction tests were conducted according to the standard of GB 10686.
[0031] Test Temperature: 16 °C ; Humidity: 40% RH(relative humidity); and Atmospheric Pressure: 100kPa
Sample Gauge: 10(diameter) × 150mm
Number of Samples: six bars
Rotational Speed of Revolving Tray: 3000 r/min
Testing Gas: a mixture of methane and air
Concentration of Testing Gas: 6.0-7.0 %
Pressing Force used in the Test: 490 N
Times of Test per min.: five
Process of Test: 5 times of friction tests were conducted for each sample, and no explosion for all of 30 times of rotational friction tests was taken as being qualified.
The tested results are shown in Table 1:

Table 1: Results of Explosion Proof Property Tests for the samples of Examples 1-7

Sample	Results for Free Falling Hammer Tests	Results for Rotational Friction Tests
Example 1:	Qualified	Qualified
Example 2:	Qualified	Qualified
Example 3:	Qualified	Qualified
Example 4:	Qualified	Qualified
Example 5:	Qualified	Qualified
Example 6:	Qualified	Qualified
Example 7:	Qualified	Qualified

(B) Samples were made of alloys of examples 1 and 5 and their physical properties were measured.

Testing Method

[0032] Tensile strength and yield strength ($RP_{0.2}$) were measured according to the standard of GB/T228-2002.
Hardness Test: measured according to GB/T230.1-2004.
Testing Environment: room temperature
Testing Equipments: Double Rockwell Hardness Meter, Type T2001, INSTRON Inc. and Universal Material Testing Machine, Type SHT4106D, New Sansi Material Testing Ltd., Shenzhen

The results are shown in Table 2:

Sample	Tensile Strength/Mpa	Yield Strength/Mpa	Tensile Elongation/%	Hardness (HRB)
Example 1:	270	250	4.5	83.0
Example 5:	430	245	19.5	80.0

Claims

1. A ferroalloy which is composed of 0.01-0.26wt% of C, 0.08-1.00wt% of Si, 4.50-12.00wt% of Mn, 0.02-0.2wt% of P, 0.02-0.06wt% of S, 3.50-22.00wt% ofNi, 15.00-24.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

2. The ferroalloy according to claim 1, wherein it is composed of 0.15-0.18wt% of C, 0.085-0.09wt% of Si, 5.00-8.00wt% of Mn, 0.03-0.05wt% of P, 0.02-0.025wt% of S, 17.00-19.00wt% ofNi, 16.00-18.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

3. The ferroalloy according to claim 1, wherein
it is composed of 0.18wt% of C, 0.09wt% of Si, 8.00wt% of Mn, 0.05wt% of P, 0.02wt% of S, 19.00wt% of Ni, 18.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy; or
it is composed of 0.15wt% of C, 0.085wt% of Si, 5.00wt% of Mn, 0.03wt% of P, 0.025wt% of S, 17.00wt% of Ni, 16.00wt% of Cr and the balance of Fe, based on the weight of said ferroalloy.

4. The ferroalloy according to claim 1, wherein it further comprises 0.05-6.00wt% of Mo, based on the weight of said ferroalloy.

5. The ferroalloy according to claim 4, wherein it is composed of 0.020-0.08wt% of C, 0.09-1.00wt% of Si, 9.00-11.00wt% of Mn, 0.08-0.15wt% of P, 0.035-0.045wt% of S, 9.50-21.00wt% of Ni, 19.00-22.00wt% of Cr, 0.06-0.10wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

6. The ferroalloy according to claim 4, wherein it is composed of
0.04wt% of C, 1.00wt% of Si, 11.00wt% of Mn, 0.10wt% of P, 0.035wt% of S, 12.00wt% of Ni, 22.00wt% of Cr,

0.06wt% of Mo and the balance of Fe, based on the weight of said ferroalloy; or
0.020wt% of C, 0.09wt% of Si, 10.00wt% of Mn, 0.08wt% of P, 0.035wt% of S, 21.00wt% of Ni, 22.00wt% of Cr, 0.10wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

7. The ferroalloy according to claim 4, wherein it is composed of 0.08wt% of C, 0.095wt% of Si, 9.00wt% of Mn, 0.15wt% of P, 0.045wt% of S, 9.50wt% of Ni, 19.00wt% of Cr, 0.09wt% of Mo and the balance of Fe, based on the weight of said ferroalloy.

8. The ferroalloy according to claim 4, wherein it further comprises 0.01-4.00wt% of Cu, 0.01-0.22wt% of N and the balance of Fe, based on the weight of said ferroalloy.

9. The ferroalloy according to claim 8, wherein it is composed of 0.012-0.017wt% of C, 0.08-0.085wt% of Si, 7.50-12.00wt% of Mn, 0.02wt% of P, 0.025wt% of S, 15.00-20.00wt% of Ni, 17.00-22.00wt% of Cr, 0.05-2.00wt% of Mo, 0.09-0.12wt% of Cu, 0.09-0.12wt% of N and the balance of Fe, based on the weight of said ferroalloy.

10. The ferroalloy according to claim 8, wherein it is composed of
0.012wt% of C, 0.08wt% of Si, 12.00wt% of Mn, 0.02wt% of P, 0.025wt% of S, 20.00wt% of Ni, 22.00wt% of Cr, 0.05wt% of Mo, 0.12wt% of Cu, 0.12wt% of N and the balance of Fe, based on the weight of said ferroalloy; or
0.017wt% of C, 0.085wt% of Si, 7.50wt% of Mn, 0.02wt% of P, 0.025wt% of S, 15.00wt% of Ni, 17.00wt% of Cr, 2.00wt% of Mo, 0.09wt% of Cu, 0.09wt% of N and the balance of Fe, based on the weight of said ferroalloy.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2008/072001

A. CLASSIFICATION OF SUBJECT MATTER

C22C38/58 (2006.01)i

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: C22C

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 practicable, search terms used)

WPI, EPODOC, PAJ, CPRS, CNKI: C, carbon, Si, silicon, silicium, Mn, mangan, manganese, Ni, nickel, Cr, chrome, chromium, Fe, iron, steel, Mo, molybdenum, Cu, copper, N, nitrogen, sparkless, sparkle, spark, nonsparkability, explos+, explod+, antiknock, detonat+, blast+, outburst+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN101100729A (JIN Baofeng) 09 Jan.2008 (09.01.2008) claims 1-10, description page 2	1-10
PX	CN101235463A (LIU Guanghuo et al.) 06 Aug.2008 (06.08.2008) description page 2	1
X	GB1061559A (WESTINGHOUSE ELECTRIC CORP) 15 Mar.1967 (15.03.1967) claim 4	1
X	JP9-202944A (NIPPON STEEL CORP) 05 Aug.1997 (05.08.1997) claim 1	4
X	JP2005-15856A (NIPPON STEEL CORP) 20 Jan.2005 (20.01.2005) claim 2	8
X	US6048416A (SPRI-N et al.) 11 Apr.2000 (11.04.2000) claim 1	8

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 Nov.2008 (04.11.2008)	**20 Nov. 2008 (20.11.2008)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer PANG Limin Telephone No. (86-10)62084751

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2008/072001

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US3753693A (ARMCO STEEL CORP) 21 Aug.1973 (21.08.1973) claim 2	8
A	EP0508574A1 (CRUCIBLE MATERIALS CORP) 14 Oct.1992 (14.10.1992) whole document	1-10
A	CN86105368A (SHIJIAZHUANG COPPER) 25 Mar.1987 (25.03.1987) whole document	1-10
A	WANG Zhongmin et al., Study and Application on New Sparkle Proof Alloy, Foundry Technology, 2001 No.3, pages 51-53	1-10

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2008/072001

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN101100729A	09.01.2008	NONE	
CN101235463A	06.08.2008	NONE	
GB1061559A	15.03.1967	NL6407494A	04.01.1965
		US3247947A	26.04.1966
JP9-202944A	05.08.1997	NONE	
JP2005-15856A	20.01.2005	NONE	
US6048416A	11.04.2000	EP0953651A1	03.11.1999
		FR2778188AB	05.11.1999
		EP0953651B1	25.06.2003
		DE69909012E	31.07.2003
		AT243770T	15.07.2003
		DE69909012T	01.04.2004
US3753693A	21.08.1973	DE2336606A	06.02.1975
		FR2236957A	14.03.1975
		SE7308714A	28.04.1975
		JP50033916A	02.04.1975
		GB1432396A	14.04.1976
		CA995929A	31.08.1976
EP0508574A1	14.10.1992	CA2061765A	12.10.1992
		JP5171366A	09.07.1993
		MX9201431A	01.10.1992
CN86105368A	25.03.1987	NONE	

Form PCT/ISA/210 (patent family annex) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 85103868 **[0003]**
- GB 1068689 A **[0025]**
- GB 10686 A **[0026] [0030]**
- GB T2282002 A **[0032]**
- GB T23012004 A **[0032]**