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Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

[Continued on next page]

(54) Title: CEMENTED CARBIDE-METALLIC ALLOY COMPOSITES

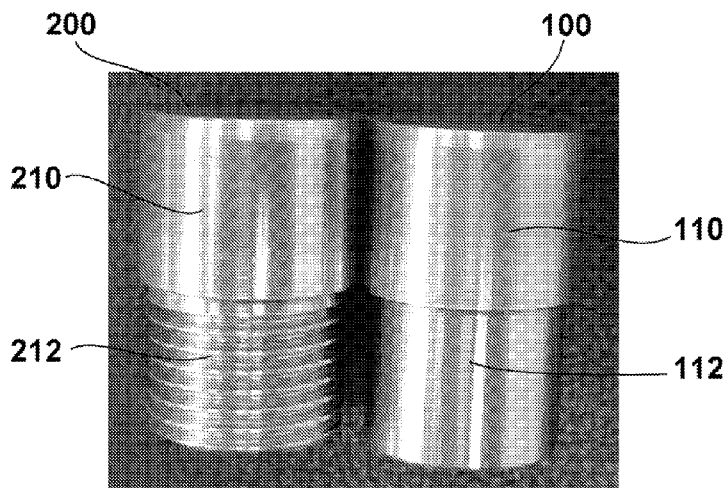


FIG. 1a

(57) Abstract: A macroscopic composite sintered powder metal article including a first region including cemented hard particles, for example, cemented carbide. The article includes a second region including one of a metal and a metallic alloy selected from the group consisting of a steel, nickel, a nickel alloy, titanium, a titanium alloy, molybdenum, a molybdenum alloy, cobalt, a cobalt alloy, tungsten, and a tungsten alloy. The first region is metallurgically bonded to the second region, and the second region has a thickness of greater than 100 microns. A method of making a macroscopic composite sintered powder metal article is also disclosed, herein. The method includes co-press and sintering a first metal powder including hard particles and a powder binder and a second metal powder including the metal or metal alloy.

WO 2009/149071 A3

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. C22C29/00 B22F7/02

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)
C22C B22F

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/131081 A1 (MIRCHANDANI PRAKASH K [US] ET AL) 22 June 2006 (2006-06-22) figures 4,6; examples 2,4	1-3, 17-19,33
X	US 2003/051924 A1 (TSUDA KEIICHI [JP] ET AL) 20 March 2003 (2003-03-20) figures 4-7; examples 1-4	1-3, 17-19,33
X	US 5 792 403 A (MASSA TED R [US] ET AL) 11 August 1998 (1998-08-11) figures 7,8; example 1	1-3, 17-19,33
X	US 6 511 265 B1 (MIRCHANDANI PRAKASH K [US] ET AL) 28 January 2003 (2003-01-28) examples 1-3	1-3, 17-19,33

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 document 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 26 November 2009	Date of mailing of the international search report 20/04/2010
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer González Junquera, J
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INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3, 17-19, 33

Sintered powder metal articles with the features as defined in claim 1, optionally with further features related to the thermal conductivity of the second region.

2. claims: 4, 20

Sintered powder articles of claim 1 (and the corresponding method of claim 17+33) with further features related to the thermal conductivity of the second region.

3. claims: 5-6, 21-22

Sintered powder articles of claim 1 with further features related to hard particles present in the second region

4. claims: 7-12, 23-28

Sintered powder articles of claim 1 with further features related to the following features of the first region: type of hard particles (general and most preferred -tungsten carbide) and their preferred average grain size, and type of metallic binder phase (general and preferred -cobalt)

5. claims: 13, 29

Sintered powder articles of claim 1 with further features related to the volume percent of the binder and hard particles in the first region.

6. claims: 14-16, 30-32

Sintered powder articles of claim 1 with further features related to a type of hard particles in the first region ("hybrid cemented carbide phase") which is different from the preferred type of invention d), and to the "contiguity ratio" of the cemented carbide phase in the hybrid cemented carbide phase

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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