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Declarations under Rule 4.17:

[Continued on next page]

(54) Title: EARTH-BORING PARTICLE-MATRIX ROTARY DRILL BIT AND METHOD OF MAKING THE SAME

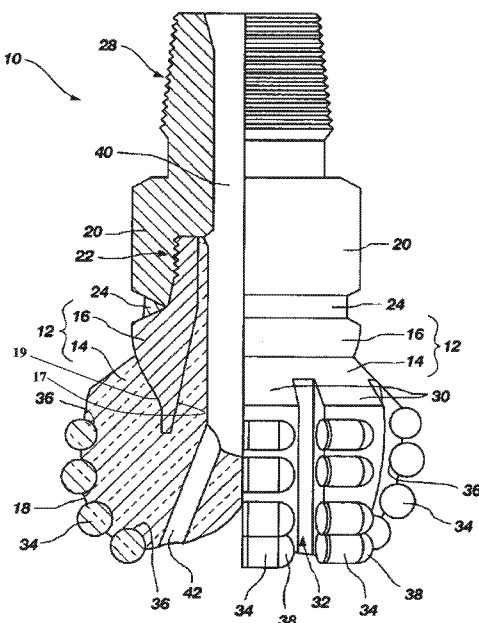


FIG. 1

(57) Abstract: An earth-boring rotary drill bit includes a bit body configured to carry one or more cutters for engaging a subterranean earth formation, the bit body comprising a particle-matrix composite material having a plurality of hard particles dispersed throughout a matrix material, the matrix material comprising a shape memory alloy. The matrix material comprises a metal alloy configured to undergo a reversible phase transformation between an austenitic phase and a martensitic phase. The matrix material may include an Ni-based alloy, Cu-based alloy, Co-based alloy, Fe-based alloy or Ti-based alloy. The drill bit may be made by a method that includes: providing a plurality of hard particles in a mold to define a particle precursor of the bit body; infiltrating the particle precursor of the bit body with a molten matrix material comprising a shape memory alloy forming a particle-matrix mixture; and cooling the molten particle-matrix mixture to solidify the matrix material and forming a bit body having a particle-matrix composite material comprising a shape memory alloy.



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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
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A. CLASSIFICATION OF SUBJECT MATTER***B22F 3/12(2006.01)i, C22C 29/00(2006.01)i, E21B 10/42(2006.01)i, E21B 10/54(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)

B22F 3/12; B22F 3/00; E21B 10/00; E21B 10/46; E21B 10/62; E21B 47/02; E21B 7/04; H01F 1/26

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: drill bit, shape memory alloy, particle-matrix composite

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 03461250 B2 (NIPPON STEEL CO. et al.) 15 August 2003 See the abstract; figures 1-6; and claim 1	1-21
A	JP 2007-281009 A (YASKAWA ELECTRIC CO.) 25 October 2007 See the abstract; figures 1-3; and claims 1-6	1-21
A	US 2007-0227775 A1 (NING MA et al.) 04 October 2007 See the abstract; figures 1-8; and claims 1-16	1-21
A	US 2007-0102199 A1 (REDD H. SMITH et al.) 10 May 2007 See the abstract; figures 1-7; and claims 1-69	1-21
A	US 2008-0210473 A1 (YOUHE ZHANG et al.) 04 September 2008 See the abstract; figures 1-5; and claims 1-18	1-21



Further documents are listed in the continuation of Box C.



See patent family annex.

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Information on patent family members

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