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(71) Applicant *(for all designated States except US)*: **BAKER HUGHES INCORPORATED** [US/US]; P.O. Box 4740, Houston, TX 77210 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **STEVENS, John, H.** [US/US]; 9110 Grogans Mill Rd., The Woodlands, TX 77380 (US). **EASON, Jimmy, W.** [US/US]; 9110 Grogans Mill Rd., The Woodlands, TX 77380 (US).

(74) Agents: **WELBORN, Brian, S.** et al.; Intellectual Property Counsel, Baker Hughes Incorporated, P.O. Box 4740, Houston, TX 77210-4740 (US).

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Declarations under Rule 4.17:

[Continued on next page]

(54) Title: METHODS SYSTEMS AND COMPOSITIONS FOR MANUFACTURING DOWNHOLE TOOLS AND DOWNHOLE TOOL PARTS

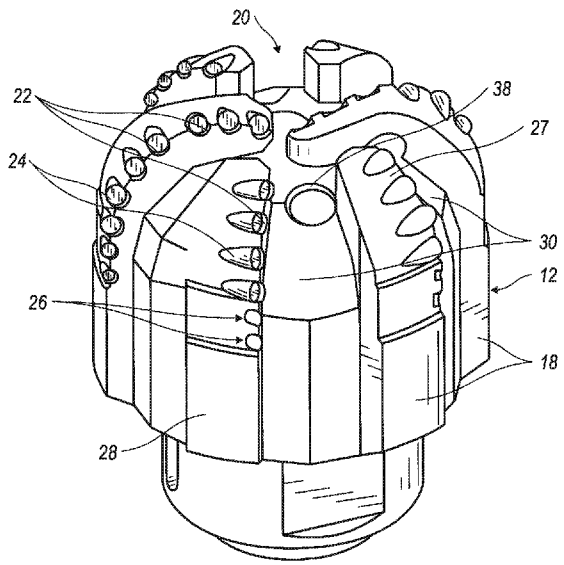

FIG. 1

(57) Abstract: Methods, systems and compositions for manufacturing downhole tools and downhole tool parts for drilling subterranean material are disclosed. A model having an external peripheral shape of a downhole tool or tool part is fabricated. Mold material is applied to the external periphery of the model. The mold material is permitted to harden to form a mold about the model. The model is eliminated and a composite matrix material is cast within the mold to form a finished downhole tool or tool part.

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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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AMENDED CLAIMS
received by the International Bureau on 09 March 2011 (09.03.2011)

What is claimed is:

1. A method of manufacturing a downhole tool part for drilling subterranean material comprising:

fabricating a model having an external peripheral shape of a downhole tool part;

applying a mold material to at least a portion of the external periphery of the model;

permitting the mold material to harden to form a mold about the model;

eliminating the model from within the mold; and

casting a composite matrix material within the mold.

2. The method as recited in claim 1, wherein the composite matrix material is cast within the mold containing a selectively dispersed particulate material.

3. The method as recited in claim 2, wherein the particulate material comprises at least one constituent selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), macro-crystalline tungsten carbide, cobalt, titanium carbide, tantalum carbide, metal borides, metal oxides, metal nitrides, polycrystalline diamond compact (PDC), thermally stable polycrystalline diamond (TSP), cubic boron nitride (CBN), polycrystalline cubic boron nitride (PCBN), tungsten, iron, nickel, titanium and boron carbide.

4. The method as recited in claim 2, wherein the particulate material increases at least one of wear resistance, strength and toughness of a selective surface of the downhole tool part formed from casting the composite matrix material within the mold.

5. The method as recited in claim 1, wherein eliminating the model from within the mold includes at least one of burning, melting, vaporizing and dissolving the model.

6. The method as recited in claim 1, wherein the composite matrix material comprises at least two constituents selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), cobalt, tungsten, iron, nickel, titanium and boron carbide.

7. The method as recited in claim 1, wherein casting occurs at or above the eutectic temperature of the composite matrix material.

8. The method as recited in claim 1, wherein the composite matrix material is a eutectic composition of at least two constituents.

9. The method as recited in claim 1, wherein the composite matrix material comprises tungsten carbide and cobalt.

10. The method as recited in claim 9, wherein the tungsten carbide content is about 25 atomic percent and the cobalt content is about 75 atomic percent.

11. The method as recited in claim 9, wherein the cobalt content is equal to or greater than about 70 atomic percent.

12. The method as recited in claim 1, wherein the downhole tool part is a drill bit body.

13. The method as recited in claim 12, further comprising positioning a bit body element at the external periphery of the model and then applying the mold material to at least a portion of the external periphery of the model and at least a portion of the bit body element.

14. The method as recited in claim 13, wherein the bit body element is at least one of a cutting element, a bearing structure, a gage trimmer, a nozzle and a cutting control structure.

15. The method as recited in claim 14, wherein the bit body element is fabricated from tungsten carbide and cobalt.

16. The method as recited in claim 15, wherein the cobalt content is less than 20 weight percent.

17. The method as recited in claim 1, wherein the downhole tool part is a roller cone.

18. The method as recited in claim 17, further comprising positioning at least one of a cutting insert and a bearing element within the model and then applying the mold material to at least a portion of the model, and at least a portion of one of the cutting insert and the bearing element.

AMENDED SHEET (ARTICLE 19)

19. The method as recited in claim 18, wherein the cutting insert is fabricated from tungsten carbide and cobalt.

20. The method as recited in claim 19, wherein the cobalt content is less than 20 weight percent.

21. The method as recited in claim 1, wherein the casting of the composite matrix material occurs under vacuum conditions.

22. The method as recited in claim 1, wherein the casting of the composite matrix material occurs in a protective atmosphere.

23. The method as recited in claim 22, wherein the protective atmosphere is one of an inert atmosphere and a reducing atmosphere.

24. The method as recited in claim 1, wherein the casting of the composite matrix material occurs in air.

25. A downhole tool part for drilling subterranean material, wherein the downhole tool part is manufactured by casting a composite matrix material within a mold containing a selectively dispersed particulate material.

26. The downhole tool part as recited in claim 25, wherein the particulate material comprises at least one constituent selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), macro-crystalline tungsten carbide, cobalt, titanium carbide, tantalum carbide, metal borides, metal oxides, metal nitrides, polycrystalline diamond compact (PDC), thermally stable polycrystalline diamond (TSP), cubic boron nitride (CBN), polycrystalline cubic boron nitride (PCBN), tungsten, iron, nickel, titanium and boron carbide.

27. The downhole tool part as recited in claim 25, wherein the particulate material increases at least one of wear resistance, strength and toughness of a selective surface of the downhole tool part formed from casting the composite matrix material within the mold.

28. The downhole tool part as recited in claim 25, wherein the composite matrix material comprises at least two constituents selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), cobalt, tungsten, iron, nickel, titanium and boron carbide.

29. The downhole tool part as recited in claim 25, wherein the casting occurs at or above the eutectic temperature of the composite matrix material.

30. The downhole tool part as recited in claim 25, wherein the composite matrix material is a eutectic composition of at least two constituents.

31. The downhole tool part as recited in claim 25, wherein the composite matrix material comprises tungsten carbide and cobalt.

32. The downhole tool part as recited in claim 31, wherein the tungsten carbide content is about 25 atomic percent and the cobalt content is about 75 atomic percent.

33. The downhole tool part as recited in claim 31, wherein the cobalt content is equal to or greater than about 70 atomic percent.

34. The downhole tool part as recited in claim 25, wherein the downhole tool part is a bit body.

35. The downhole tool part as recited in claim 25, wherein the downhole tool part is a roller cone.

36. A composition for manufacturing a downhole tool part for drilling subterranean material comprising: a continuous phase and a selectively dispersed particulate phase.

37. The composition as recited in claim 36, wherein the continuous phase comprises at least one constituent selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), cobalt, tungsten, iron, nickel, titanium and boron carbide.

38. The composition as recited in claim 36, wherein the selectively dispersed particulate phase comprises at least one constituent selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), macro-crystalline tungsten carbide, cobalt, titanium carbide, tantalum carbide, metal borides, metal oxides, metal nitrides, polycrystalline diamond compact (PDC), thermally stable polycrystalline diamond (TSP), cubic boron nitride (CBN), polycrystalline cubic boron nitride (PCBN), tungsten, iron, nickel, titanium and boron carbide.

39. The composition as recited in claim 36, wherein the continuous phase is cobalt and the selectively dispersed particulate phase is monotungsten carbide (WC).

40. The composition as recited in claim 39, wherein the cobalt content is equal to or greater than about 70 atomic percent.

41. The composition as recited in claim 36, further comprising a eutectic particulate phase.

42. The composition as recited in claim 41, wherein the eutectic particulate phase comprises a eutectic composition of at least two constituents selected from the group comprising: monotungsten carbide (WC), ditungsten carbide (W_2C), cobalt, tungsten, iron, nickel, titanium and boron carbide.

43. The composition as recited in claim 36, further comprising a sub-stoiciometric phase having the formula M_xC, where M is cobalt or tungsten, C is carbide and x is a number between 1 and 6.

Statement under Article 19(1)

Pursuant to Article 19(1), Applicant offers the following remarks with regard to the submitted amendments to the claims. The claim amendments do not go beyond the disclosure as filed and do not require changes to the specification or the drawings.