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(54) **NEW CUTTING PICK**

(57) The present invention discloses a new cutting pick, comprising a body, a cutting tooth and a circular frustum peg provided on the body; wherein the cutting tooth is a polycrystalline diamond composite tooth and consists of a polycrystalline diamond composite layer and a hard alloy base seat; the body of the cutting pick comprises a body upper portion and a body lower portion, the body upper portion is provided therein with a hollow structure which is embedded with the cutting tooth part as well as the circular frustum peg; the body upper portion is provided at its top with a cone hole; the hard alloy base seat of the cutting tooth, the circular frustum peg, and the cone hole provided at the top of the body upper portion are connected together by interference fit. With the above solution(s) of the present invention, the effect(s) of welding or hot-pressing on the polycrystalline diamond cutting teeth can be avoided, the impact resistance and the wear resistance of the diamond composite teeth can be significantly improved, and the service life of the cutting pick can be significantly prolonged.

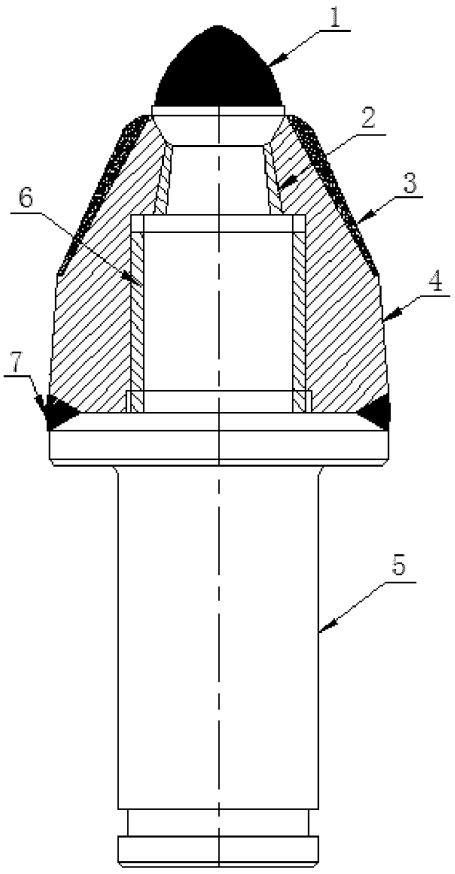

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of roadway excavation machines, coal winning machines, shield machines and rotary drilling rigs, and specifically to a new cutting pick.

BACKGROUND OF THE INVENTION

[0002] In the prior art, excavation machines, combined mining machines, shield machines and rotary drilling rigs are widely used various coal mine tunnel excavation engineering constructions. The cutting head is a main part in the excavation machines, combined mining machines, shield machines and rotary drilling rigs. The cutting pick is fixed, via a tooth seat, onto the cutting head. The cutting pick generally uses a hard alloy tooth tip (called as the hard alloy cutting pick), generally in a shape of a circular cone, and is directly fixed onto the respective base seat. During a practical working process, the cutting head, as the main stressed part, cuts rocks by the cutting pick in an impacting manner.

[0003] In this case, when facing a rock stratum with a relatively higher hardness, it bears a relatively larger impact load and friction, and the hard alloy cutting pick thereon wears fast, thus affecting the working efficiency seriously.

[0004] A traditional cutting pick is composed of two portions: the hard alloy tooth head and the cutting pick body which are generally connected together into one piece by the high temperature welding or hot-pressing technology, with copper as the welding material. During welding, the high temperature will affect the component structure in the hard alloy and decrease the strength, wear resistance and impact resistance of the cutting pick, thus reducing the service life of the cutting pick. Therefore, there is a need for a cutting pick having better impact resistant strength and wear resistance in production.

SUMMARY OF THE INVENTION

[0005] In order to solve the above technical problem(s), a new cutting pick is provided according to the present invention which is high in impact resistance and in wear resistance.

[0006] According to the present invention, the solutions to solve the above technical problem(s) are provided as follows:

A new cutting pick, comprising a body, a cutting tooth (1) provided on the body, and a circular frustum peg (2); wherein the cutting tooth (1) is a polycrystalline diamond composite tooth and consists of a polycrystalline diamond composite layer (12) and a hard alloy base seat (13); the polycrystalline diamond composite layer (12) of the cutting tooth, as the cutting tooth of the cutting pick, extends out of the body of the cutting pick; the body of the cutting pick comprises a body upper portion (4) and a body lower portion (5).

[0007] Further, the body upper portion is provided therein with a hollow structure which is embedded with the cutting tooth part (1) as well as the circular frustum peg (2); the body upper portion is provided at its top with a cone hole (8); the hard alloy base seat (13) of the cutting tooth, the circular frustum peg (2), and the cone hole (8) provided at the top of the body upper portion are connected by interference fit.

[0008] Further, the body upper portion (4) and the body lower portion (5) are interconnected together by a screw thread (6).

[0009] Further, a welding groove (7) is provided at the site of the interconnection which is connected together by performing welding to the welding groove, thus forming an integral structure.

[0010] Further, the body lower portion (5) is provided at its top with a connecting push rod (9) which is in contact with the hard alloy base seat (13) of the cutting tooth and the circular frustum peg (2).

[0011] Further, the body lower portion (5) is provided at its bottom with a clip spring groove (10) which is held to the base seat of the cutting pick.

[0012] Further, the body upper portion is provided at its wearing area with a wear resistant layer (3); the wear resistant layer is formed by surfacing welding a tungsten carbide welding rod to the wearing area of the body of the cutting pick using the argon arc welding technology, and is all coated onto the surface of the body.

[0013] Further, the wear resistant layer (3) on the body upper portion of the cutting pick is welded in a ring shape, wherein the tungsten carbide layer by surfacing welding is added layer by layer in an axial direction of the body, with its thickness increasing accordingly in a direction perpendicular to the axial direction of the body.

[0014] Further, the body of the cutting pick is rotationally connected with a tooth seat center.

[0015] Further, the body lower portion is provided at its middle portion with a cylindrical platform (11) which is located below the screw thread of the body lower portion.

[0016] According to the present invention, with the above solutions, the effect(s) of welding or hot-pressing on the polycrystalline diamond cutting teeth can be avoided, the impact resistance and the wear resistance of the diamond composite teeth can be significantly improved, and the wear resistant layer added to the wearing area of the cutting pick can improve the wear resistance of the cutting pick and provide excellent support to the diamond composite teeth.

[0017] Other features and advantages of the present invention will be explained hereinafter in the description or can be understood by implementation of the present invention. The purpose(s) and other advantages of the present invention can be achieved and obtained by the structures specifically indicated in the description, the claims as well as the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

[0018] Hereinafter, the present invention will be described in detail with reference to the accompanying drawings to make the above advantage(s) of the present invention clearer.

Figure 1 is a structural diagram of a cutting pick of the present invention;

Figure 2 is a structural diagram of a body upper portion and a body lower portion of the new cutting pick of figure 1;

Figure 3 is a structural diagram of a polycrystalline diamond composite tooth of the cutting pick of the present invention; and

Figures 4 and 5 are structural diagrams of a circular frustum peg of the cutting pick of the present invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0019] Hereinafter, the specific implementations of the present invention will be further described in detail, in connection with the accompanying drawings and specific embodiments. The following embodiments are provided for explaining the present invention, rather than limiting the scope of the present invention.

[0020] As shown in figures 1 and 2, the structural diagrams of a new cutting pick according to the embodiment(s) of the present invention are provided. The new cutting pick comprises: a body, a cutting tooth part provided and a circular frustum peg (2) on the body; wherein the cutting tooth part comprises a polycrystalline diamond composite layer (12) and a hard alloy base seat (13); the body of the cutting pick comprises a body upper portion (4) and a body lower portion (5), the body upper portion is provided therein with a hollow structure which is embedded with the cutting tooth part as well as the circular frustum peg (2), and in addition, the body upper portion is provided at its top with a cone hole (8); the polycrystalline diamond composite layer (12) of the cutting tooth, as the cutting tooth of the cutting pick, is higher than the body. The hard alloy base seat (13) of the cutting tooth, the circular frustum peg (2) as shown, and the cone hole (8) provided at the top of the body upper portion are connected together by interference fit.

[0021] More specifically, the body upper portion (4) and the body lower portion (5) are interconnected together by a screw thread. The body upper portion is provided with an inner screw thread and the body lower portion is provided with an outer screw thread. The body lower portion is provided at its top with a connecting push rod (9) which presses against the bottom of the hard alloy base seat (13) of the cutting tooth and the bottom of the circular frustum peg (figure 4). In a preferred embodiment, a welding groove (7) is provided at the site of the interconnection which is connected together by performing welding to the welding groove, thus forming an integral structure.

[0022] In addition, the body lower portion is provided at its bottom with a clip spring groove (10) which is connected to the base seat of the cutting pick, wherein the body of the cutting pick is rotationally connected with a tooth seat center.

[0023] In an embodiment, during mounting, the hard alloy base seat (13) of the cutting tooth and the circular frustum peg (2) are secured into the cone hole by the pretension force of the screw threads of the body upper portion and the body lower portion as well as the cooperation with the connecting push rod (9); and then the interconnection site of the upper and lower bodies of the cutting pick for pretension is welded. Such improvement results in that the effect(s) of high temperature during welding or hot-pressing on the bonded structure between the diamond composite layer and the alloy base seat of the polycrystalline diamond cutting teeth can be avoided, and thus the impact resistance and the wear resistance of the new diamond composite can be significantly improved such that it can be applied to coal seam or rock stratum mining, to replace the hard alloy.

[0024] In an embodiment, the explanation is provided referring to figure 3. The cutting tooth comprises the polycrystalline diamond composite layer (12) and the hard alloy base seat (13), the hard alloy base seat (13) is engaged and secured to the cone hole of the body upper portion of the cutting pick by the circular frustum peg (figure 4), and during assembling of angle a, the circular cone face and the inner side face of the circular frustum peg (figure 4) are completely secured and engaged. The polycrystalline diamond composite tooth is used as an excavation tool for cutting rocks, to replace the hard alloy tooth tip.

[0025] In an embodiment, as shown in figures 1 and 2, at least a portion of the body upper portion is provided with a wear resistant layer (3) which is welded in a ring shape. The wear resistant layer is coated onto the surface of the wearing area on the body of the cutting pick. The wear resistant layer is formed by surfacing welding a tungsten carbide welding rod to the wearing area of the body of the cutting pick using the argon arc welding technology. During welding, a dedicated clamping tool is used to rotate the body of the cutting pick and also the tungsten carbide welding rod is surfacing-welded using the argon arc welding, wherein the body is preheated before welding and is processed by heat preservation measures after welding. Thus, the wear resistant effect of the wearing area of the body can be improved.

[0026] In an embodiment, as shown in figure 4, the peg is in a circular frustum shape which is provided on its circumference with a through groove 14 by machining. During assembling, the circular coning platform face at the bottom of the hard alloy base seat (13) and the inner side face of the circular frustum peg (figure 4) are completely secured and engaged, and the outer side face of the circular frustum peg and the circular cone face (8) of the body upper portion are completely engaged and secured.

[0027] In an embodiment, the polycrystalline diamond cutting tooth may be made from the prior diamond composite materials. For example, in a preferred embodiment, during manufacturing, the cutting tooth having a reasonable size is produced according to the requirements of design parameters, and it is formed by putting the diamond powder and the adhesive onto the hard alloy and then performing sintering under high temperature and high pressure.

[0028] In an embodiment, the body lower portion is provided at its middle portion with a cylindrical platform (11) which is located below the screw thread of the body lower portion.

[0029] In the present invention, based on the prior art, the polycrystalline diamond composite tooth is used as the cutting tooth of the cutting pick. The improved cutting pick uses the screw thread to fasten the cutting tooth as well as the circular frustum peg into the fitting cone hole of the body. In addition, the wear resistant layer is added to the wearing area of the cutting pick such that the impact resistance and the wear resistance of the cutting pick are improved.

[0030] Moreover, the body of the cutting pick can provide excellent support to the new diamond composite teeth. The diamond composite tooth is used as an excavation tool for cutting rocks, to replace the hard alloy tooth.

[0031] Finally, it should be noted that the above description is provided only for the preferred embodiments of the present invention, not for limiting the present invention. Though the present invention is explained in detail with reference to the above embodiments, those skilled in the art can make amendments to the technical solutions recorded in the above embodiments or make equivalent substitutions to some technical features therein.

[0032] Any modification, equivalent substitution, improvement and the like made within the scope of the spirit and principle of the present invention should fall within the protection scope of the present invention. Those skilled in the art should understand that the above specific description is provided only for the purpose of explaining the present invention, rather than limiting the present invention. The protection scope of the present invention is defined by the claims and the equivalent solutions thereof.

Claims

1. A new cutting pick, comprising a body, a cutting tooth (1) and a circular frustum peg (2) provided on the body;
   wherein the cutting tooth (1) is a polycrystalline diamond composite tooth and consists of a polycrystalline diamond composite layer (12) and a hard alloy base seat (13); the polycrystalline diamond composite layer (12) of the cutting tooth, as the cutting tooth of the cutting pick, extends out of the body of the cutting pick; the body of the cutting pick comprises a body upper portion (4) and a body lower portion (5).

2. The new cutting pick according to claim 1, **characterized in that**
   the body upper portion is provided therein with a hollow structure which is embedded with the cutting tooth part (1) as well as the circular frustum peg (2);
   the body upper portion is provided at its top with a cone hole (8);
   the hard alloy base seat (13) of the cutting tooth, the circular frustum peg (2), and the cone hole (8) provided at the top of the body upper portion are connected by interference fit.

3. The new cutting pick according to claim 1, **characterized in that**
   the body upper portion (4) and the body lower portion (5) are interconnected together by a screw thread (6).

4. The new cutting pick according to claim 3, **characterized in that**
   a welding groove (7) is provided at the site of the interconnection.

5. The new cutting pick according to claim 1, **characterized in that**
   the body lower portion (5) is provided at its top with a connecting push rod (9) which is in contact with the hard alloy base seat (13) of the cutting tooth and the circular frustum peg (2).

6. The new cutting pick according to claim 1, **characterized in that**
   the body lower portion (5) is provided at its bottom with a clip spring groove (10) which is held to the base seat of the cutting pick.

7. The new cutting pick according to claim 1, **characterized in that**
   the body upper portion is provided at its wearing area with a wear resistant layer (3); the wear resistant layer is formed by surfacing welding a tungsten carbide welding rod to the wearing area of the body of the cutting pick using the argon arc welding technology, and is all coated onto the surface of the body.

8. The new cutting pick according to claim 7, **characterized in that**
   the wear resistant layer (3) on the body upper portion of the cutting pick is welded in a ring shape, wherein the tungsten carbide layer by surfacing welding is added layer by layer in an axial direction of the body, with its thickness increasing accordingly in a direction perpendicular to the axial direction of the body.

9. The new cutting pick according to claim 1, **characterized in that**
the body of the cutting pick is rotationally connected with a tooth seat center.

10. The new cutting pick according to claim 1, **characterized in that**
the body lower portion is provided at its middle portion with a cylindrical platform (11) which is located below the screw thread of the body lower portion.

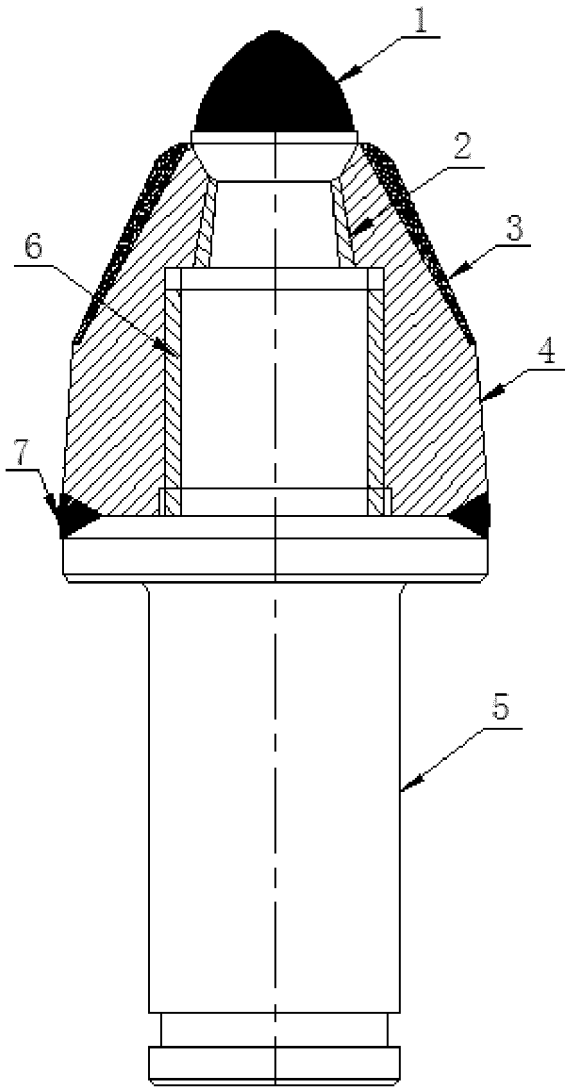

Fig. 1

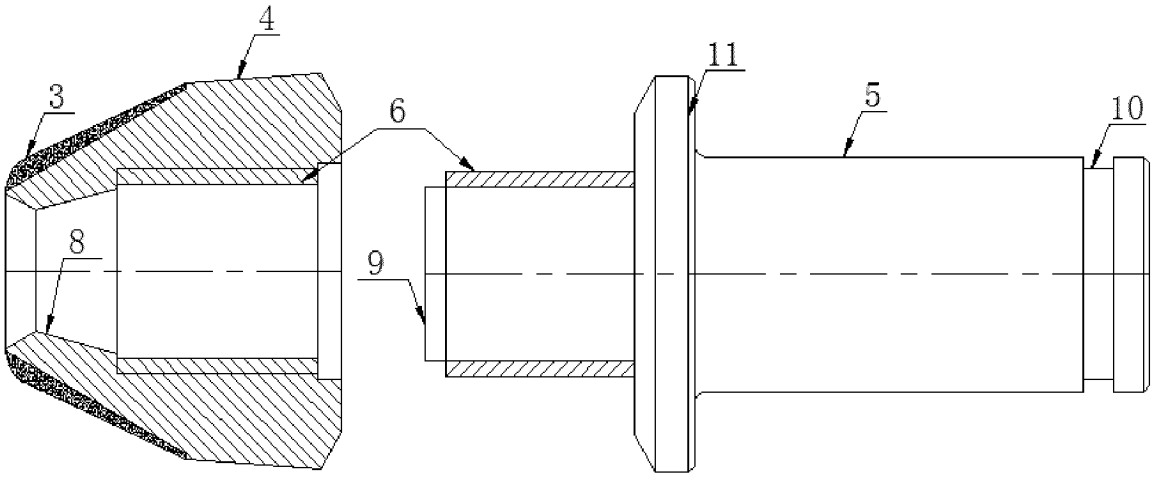

Fig. 2

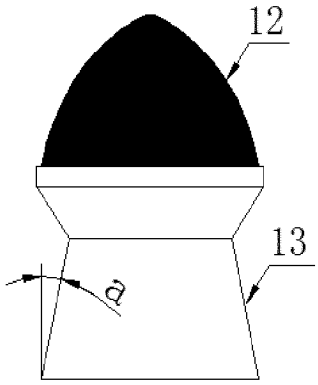

Fig. 3

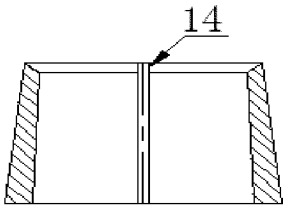

Fig. 4

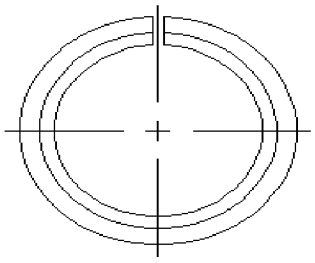

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/092134

A. CLASSIFICATION OF SUBJECT MATTER

E21C 35/183 (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)

E21C; F16L; F16B; B23P

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)

CNPAT; CNKI; WPI; EPODOC: 固定, 开口, 锥, 垫, 孔, 接头, 管接头, 截齿, 紧固, 楔, 顶, 槽, 缝, 圆锥, 螺纹, 垫, 接头, 管, 紧固, replac+, apertur+, pore, hole, hob+, bit+, wedge, taper+, cutter+, shank+, tip+, thread+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203441492 U (YANG, Gang), 19 February 2014 (19.02.2014), description, particular embodiments, and figures 3-5	1, 3-10
PX	CN 106351657 A (YANG, Gang), 25 January 2017 (25.01.2017), description, particular embodiments, claims 1-10, and figures 1-5	1-10
E	CN 206513367 U (YANG, Gang), 22 September 2017 (22.09.2017), description, particular embodiments, claims 1-10, and figures 1-5	1-10
A	CN 103009001 A (HENAN MEIKEYUAN WEAR-RESISTING TECHNOLOGY CO., LTD. et al.), 03 April 2013 (03.04.2013), entire document	1-10
A	CN 201420554 Y (NIU, Zhiping), 10 March 2010 (10.03.2010), entire document	1-10
A	CN 203347793 U (HEILONGJIANG INSTITUTE OF SCIENCE AND TECHNOLOGY), 18 December 2013 (18.12.2013), entire document	1-10
A	CN 202991038 U (YANG, Gang), 12 June 2013 (12.06.2013), entire document	1-10

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

* Special categories of cited documents:

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

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"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
15 September 2017	11 October 2017
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer MA, Xuesong Telephone No. (86-10) 010-62412949

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/092134

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/092134

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Form PCT/ISA/210 (patent family annex) (July 2009)