

CUTTING RING FOR CONCRETE PUMP TRUCK AND MANUFACTURING METHOD THEREOF AS WELL AS CONCRETE PUMP TRUCK

CROSS-REFERENCE TO RELATED APPLICATIONS

5 [0001] The present disclosure is based on and claims priority to China Patent Application No. 202111203865.4 filed on October 15, 2021, the present disclosure of which is incorporated by reference herein in its entirety.

FIELD OF THE DISCLOSURE

10 [0002] The present disclosure relates to the technical field of engineering machinery, particularly to a cutting ring for a concrete pump truck and a manufacturing method thereof as well as the concrete pump truck.

BACKGROUND OF THE DISCLOSURE

15 [0003] A cutting ring is a key part for a concrete pump truck. In the process of pumping, a spectacle plate and the cutting ring move back and forth alternately to realize material suction and feeding. The cutting ring needs not only good wear-resistant property but also a certain shock resistance. Compared with the spectacle plate, the cutting ring is more easily worn and lower in service life.

[0004] To improve the service life of the cutting ring, most of the cutting rings in the existing industry are fabricated using a method that a hard alloy is inlaid on a steel matrix, for example single alloy + inner hole
20 surfacing welding, double alloy + inner hole surfacing welding or all alloy, and some cutting rings use a diamond material.

[0005] The method that the hard alloy is inlaid on the steel matrix to improve the wear resistance is adopted, a single alloy, a dual alloy or an all alloy is obtained by combining the steel matrix with the hard alloy via copper brazing, a part of gaps between the matrix and the copper brazing is poor in wear resistance. After being
25 worn, the hard alloy is naked, and cracks, collapse, falling and other problems easily occur when being shocking; the steel matrix that is not wear-resistant is in direct contact with a concrete material to cause the concrete to leak slurry in the process of transportation and seriously lead to the failure of the cutting ring in advance, which needs halting to maintain and change parts, thereby seriously affecting the progress of construction.

[0006] In addition, from the viewpoint of production processing, there are many production procedures of the cutting ring having the alloy inlaying structure, comprising: steel substrate blanking → surfacing → alloy grooving → alloy plate matching → brazing → alloy surface grinding → drilling → inspection, so manufacturing period is long. Furthermore, the hard alloy has high cost that accounts for 80% of the whole cutting ring price, which is disadvantageous to industrialization promotion.

[0007] It is noted that information disclosed in the technological part of the background of the present disclosure is only intended to increase the understanding of the total background of the present disclosure, but is not deemed as admitting or hinting this information constitution has been the prior art known by those skilled in the art in any forms.

10 **SUMMARY OF THE DISCLOSURE**

[0008] The embodiment of the present disclosure is to provide a cutting ring for a concrete pump truck and a manufacturing method thereof as well as the concrete pump truck, so as to effectively prolong the service life of the cutting ring.

[0009] According to the first aspect of the present disclosure, provided is a cutting ring for a concrete pump truck, comprising:

[0010] a ring-shaped matrix comprising a wear-prone part; and

[0011] a wear-resistant layer arranged on the wear-prone part,

[0012] wherein the wear-resistant layer and the matrix being integrally molded by casting.

[0013] In some embodiments, the wear-prone part comprises a first end surface of the matrix vertical to an axis direction of the matrix, the first end surface is provided with a groove, the wear-resistant layer comprises a first wear-resistant layer, and the first wear-resistant layer is arranged in the groove.

[0014] In some embodiments, the groove is arranged in the circumferential direction of the matrix, so that the first wear-resistant layer is of a ring shape.

[0015] In some embodiments, the wear-prone part comprises a first ring surface of the matrix on an inner circumferential side of the matrix and a second ring surface on an outer circumferential side of the matrix, the wear-resistant layer comprise a second wear-resistant layer and a third wear-resistant layer, the second wear-resistant layer is arranged on the inner side of the first ring surface, and the third wear-resistant layer is arranged on the outer side of the second ring surface.

[0016] In some embodiments, the wear-resistant layer and the third wear-resistant layer are both of ring

shapes.

[0017] In some embodiments, the matrix comprises a first section having a first line segment as well as a second section and a third section which are respectively located at the two sides of the first section, the first line segment passes through the center of a circle of the matrix and two end points of the first line segment are both located on a circumference of the matrix, the type of the material of the wear-resistant layer located in the first section is the same as or different from the type of the material of the wear-resistant layer located in the second section, and the type of the material of the wear-resistant layer located in the first section is the same as or different from the type of the material of the wear-resistant layer located in the third section.

[0018] In some embodiments, the type of the material of the wear-resistant layer located in the second section is the same as or different from the type of the material of the wear-resistant layer located in the third section.

[0019] In some embodiments, the total arc length of the first section is larger than a sum of the arc length of the second section and the arc length of the third section.

[0020] In some embodiments, the total arc length of the first section is as twice as a sum of the arc length of the second section and the arc length of the third section.

[0021] According to the second aspect of the present disclosure, provided is a concrete pump truck, comprising the above cutting ring for the concrete pump truck.

[0022] According to the third aspect of the present disclosure, provided is a manufacturing method of a cutting ring for a concrete pump truck, comprising:

[0023] providing a ring-shaped matrix model and a wear-resistant material;

[0024] coating the wear-resistant material on the wear-prone part of the matrix model; and

[0025] pouring a molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, and the cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material.

[0026] In some embodiments, the wear-resistant material comprises wear-resistant particles Al_2O_3 , wear-resistant particles WC or a mixture of wear-resistant particles Al_2O_3 and wear-resistant particles WC.

[0027] In some embodiments, the wear-resistant material comprises a mixture of wear-resistant

particles Al_2O_3 and wear-resistant particles WC, and a mass fraction ratio of wear-resistant particles Al_2O_3 to wear-resistant particles WC in the mixture is 1:1 or 4:6.

[0028] In some embodiments, the matrix model comprises a first section having a first line segment as well as a second section and a third section which are respectively located at the two sides of the first section, the first line segment passes through the center of a circle of the matrix model and two end points of the first line segment are both located on a circumference of the matrix model, and the step of coating the wear-resistant material on the wear-prone part of the matrix model comprises:

[0029] coating a first wear-resistant material in the first section of the matrix model, and coating a second wear-resistant material in the second section and the third section, wherein the types of the first wear-resistant material and the second wear-resistant material are the same or different.

[0030] In some embodiments, before the wear-resistant material is coated on the wear-prone part of the matrix model, the manufacturing method also comprises:

[0031] drying the wear-resistant material in an oven in advance, wherein the drying temperature is set as $180^\circ\text{C}\sim 300^\circ\text{C}$, heat preservation time is 1.5 h~3 h, and then cooling to room temperature; and

[0032] adding a liquid binding agent in the wear-resistant material.

[0033] In some embodiments, the step of coating the wear-resistant material on the wear-prone part of the matrix model comprises:

[0034] coating the wear-resistant material on the wear-prone part of the matrix model, wherein the coating thickness is larger than a preset thickness by 0.5 mm~ 1.5 mm, and the preset thickness is a thickness of a wear-resistant layer at a corresponding position of the cutting ring finished product.

[0035] In some embodiments, the coating thickness of the wear-resistant material is 4 mm~ 8mm.

[0036] In some embodiments, the step of pouring a the molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, and the cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material comprises:

[0037] raising the temperature of a furnace is raised to $1500^\circ\text{C}\sim 1550^\circ\text{C}$, melting the matrix raw material liquid containing elements Fe, Cr, C and Mn, and casting at a molten temperature of $1480^\circ\text{C}\sim 1520^\circ\text{C}$ after the matrix raw material liquid is completely molten, melting the matrix model after encountering the matrix raw material liquid, and the matrix raw material liquid and the

wear-resistant material are integrated by casting; and

[0038] obtaining a cutting ring blank when the casting is cooled to 840°C~900°C, and then machining the cutting ring blank to obtain a cutting ring finished product.

[0039] Based on the above technical solution, in the embodiments of the present disclosure, the wear-resistant layer arranged on the wear-prone part of the matrix is integrally molded with the matrix by casting, that is, the wear-resistant layer and the matrix are jointly cast. In the process of molding, the wear-resistant layer and the matrix are integrated. Therefore, the wear-resistant layer is firmly bond to the matrix and is difficult to fall off and collapse, thereby greatly prolonging the service life of the cutting ring.

[0040] Next, other features and advantages of the present disclosure will become clear through detail description of exemplary examples of the present disclosure by reference with drawings.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0041] To illustrate the embodiments of the present disclosure or technical solution in the prior art more clearly, the embodiments or drawings required to be used in the description of the prior art will be simply introduced. Obviously, the drawings in the following description are only embodiments of the present disclosure, and persons of ordinary skill in the art can also obtain other drawings according to the provided drawings without creative efforts.

[0042] Fig. 1 is a front view of an embodiment of a cutting ring for a concrete pump truck of the present disclosure.

[0043] Fig.2 is a cross-sectional view taken along A-A section in Fig.1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0044] Next, the technical solution in the embodiments will be clearly and completely described in combination with the drawings in the embodiments of the present disclosure. Obviously, the described embodiments are only a part of embodiments of the present disclosure but not all the embodiments. Based on the embodiments of the present disclosure, all other embodiments made by persons of ordinary skill in the art without creative efforts are all comprised within the protective scope of the present disclosure.

[0045] In the description of the present disclosure, it is understood that the direction or position relationships indicated by the terms “center”, “transverse”, “longitudinal”, “front”, “back”, “left”, “right”, “upper”, “lower”,

“vertical”, “horizontal”, “top”, “bottom”, “inner” and “outer” are based on the azimuth or positional relations illustrated by the drawings, and are only for facilitating description of the present disclosure, rather than indicating or implying that the device referred thereto has to present a particular azimuth, and be constructed and operated in a particular azimuth, so that it cannot be understood as limiting the protection scope of the present disclosure.

[0046] As shown in Fig.1 and Fig.2, in some embodiments of a cutting ring for a concrete pump trunk provided by the present disclosure, the cutting ring comprises a matrix 10 and a wear-resistant layer, wherein the center of the matrix 10 is provided with a through hole, the whole matrix 10 is of a ring shape, the matrix 10 comprises a wear-prone part, the wear-resistant layer is arranged on the wear-prone part, and the wear-resistant layer and the matrix 10 are integrally molded by casting.

[0047] In the above embodiment, the wear-resistant layer arranged on the wear-prone part of the matrix 10 and the matrix 10 is integrally molded by casting, that is, the wear-resistant layer and the matrix 10 are jointly cast. In the process of molding, the wear-resistant layer and the matrix 10 are integrated, thus the wear-resistant layer is firmly bond to the matrix 10 and is difficult to fall off and collapse, thereby greatly prolonging the service life of the cutting ring.

[0048] Compared with the technical solution in the related technology that the wear-resistant layer is inlaid on the matrix, the stability and reliability of the wear-resistant layer in the embodiment of the cutting ring provided by the present disclosure are higher, and the wear-resistant layer is firmly bond to the matrix and is difficult to fall off or collapse, thus significantly prolonging the service life of the cutting ring.

[0049] In some embodiments, the wear-prone part comprises a first end surface of the matrix 10 vertical to an axis direction of the matrix 10, the first end surface is provided with a groove, the wear-resistant layer comprises a first wear-resistant layer 20, and the first wear-resistant layer 20 is provided in the groove.

[0050] The concrete pump trunk comprises a spectacle plate matched with the cutting ring, the first end surface is an end surface of the cutting ring close to one side of the spectacle plate, the first end surface is provided with a first wear-resistant layer 20, so as to improve the wear resistance of the first end surface. When being matched with the spectacle plate, the first end surface has improved wear resistance, which plays an important role in improving the service life of the whole cutting ring.

[0051] In some embodiments, the groove is arranged in the circumferential direction of the matrix 10 so that the first wear-resistant layer 20 is of a ring shape.

[0052] The groove is arranged in the circumferential direction of the matrix 10 and is of a ring shape, in this way, the first wear-resistant layer 20 is of a ring shape, and therefore the axial end surface of the matrix 10 is protected in the whole circumferential direction.

[0053] In some embodiments, the wear-prone part comprises a first ring surface of a matrix 10 on an inner circumferential side of the matrix 10 and a second ring surface on an outer circumferential side of the matrix 10, the wear-resistant layer comprises a second wear-resistant layer 30 and a third wear-resistant layer 40, the second wear-resistant layer 30 is arranged on the inner side of the first ring surface, and the third wear-resistant layer 40 is arranged on the outer side of the second ring surface.

[0054] By arranging the second wear-resistant layer 30 inside the first ring surface and arranging the third wear-resistant layer 40 outside the second ring surface, the radial outer side and inner side of the cutting ring can be protected.

[0055] In some embodiments, the second wear-resistant layer 30 and the third wear-resistant layer 40 are both of ring shapes. In this way, the radial outer side and inner side of the cutting ring can be protected in the whole circumferential direction.

[0056] In some embodiments, the matrix 10 comprises a first section 11 having a first line segment as well as a second section 12 and a third section 13 respectively located at the two sides of the first section 11, the first line segment passes through the center of a circle of the matrix 10 and two end points of the first line segment are both located on a circumference of the matrix 10, the type of the material of the wear-resistant layer located in the first section 11 is the same as or different from the type of the material of the wear-resistant layer located in the second section 12, and the type of the material of the wear-resistant layer located in the first section 11 is the same as or different from the type of the material of the wear-resistant layer located in the third section 13.

[0057] The matrix 10 is divided into the first section 11, the second section 12 and the third section 13, and the type of the material of the wear-resistant layer located in the first section 11 is set as being the same as or different from the types of the materials of the wear-resistant layers located in the second section 12 and the third section 13, and the first section 11 has a wear resistance that is the same as or different from that of the second section 12 and the third section 13.

[0058] When different wear-resistant materials are used in different regions, the improvement of the wear resistance of a working surface is facilitated and meanwhile the requirements on the wear resistance of the

non-working surface are reduced, thereby saving cost.

[0059] As shown in Fig.1, the first section 11 comprises two arc segments in left and right. The second section 12 comprises an arc segment located above the first section 11, and the third section 13 comprises an arc segment located under the first section. The first line segment is a diameter of the outer circle of the matrix 10. The outer circle is a circle with the largest diameter of the matrix 10. In Fig.1, the first line segment is a horizontal diameter.

[0060] In some embodiments, the first line segment is horizontally arranged, and the wear resistance of the wear-resistant layer located in the first section 11 is better than the wear resistance of the wear-resistant layers located in the second section 12 and the third section 13.

[0061] When the cutting ring is in a working state, the first line segment can be horizontally arranged so that the first section 11 is located in the middle, the second section 12 is located above the first section 11, the third section 13 is located under the first section 11, in this way, the first section 11 that is easily worn when being matched with the spectacle plate has stronger wear resistance, thereby prolonging the service life of the cutting ring; relative to the first section 11, the second section 12 and the third section 13 that are not easily worn can use wear-resistant materials which have relatively poor wear resistance to save cost.

[0062] In some embodiments, the type of the material of the wear-resistant layer located in the second section 12 is the same as or different from that of the wear-resistant layer located in the third section 13. The materials of the wear-resistant layers located in the second section 12 and the third section 13 can be freely selected according to practical wear situations.

[0063] In some embodiments, the total arc length of the first section 11 is larger than a sum of the arc length of the second section 12 and the arc length of the third section 13. By increasing the total arc length of the first section 11, the coverage range of the first section 11 is increased, and the area of the region having a strong wear resistance is enlarged, so as to effectively improve the whole wear-resistant ability of the cutting ring.

[0064] In some embodiments, the total arc length of the first section 11 is as twice as a sum of the arc length of the second section 12 and the arc length of the third section 13. This setting can cover the most wear-prone parts of the cutting ring and is strong in applicability.

[0065] The present disclosure provides a concrete pump truck, comprising the above cutting ring for the concrete pump truck.

[0066] The present disclosure provides a manufacturing method of a cutting ring of a concrete pump truck, comprising:

[0067] providing a ring-shaped matrix model and a wear-resistant material;

[0068] coating the wear-resistant material on the wear-prone part of the matrix model; and

5 [0069] pouring a molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, the cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material.

[0070] The matrix model can be made of a material that is molten by heating so as to melt the matrix model when the matrix raw material liquid is poured, and the matrix raw material liquid is formed according to the
10 shape of the matrix model. For example, the matrix model can be made of foams or other materials.

[0071] The matrix raw material liquid can be a liquid in which all elements are metal elements, for example a liquid containing elements Fe, Cr, C and Mn; the matrix raw material liquid can also be a liquid containing a carbon element and a metal element, and the matrix is a carbon steel material, such as Q345.

[0072] In some embodiments, the wear-resistant material comprises one or more wear-resistant
15 particles. The wear-resistant material having a preset wear-resistant ability can be prepared as required by adopting one or more wear-resistant particles, so as to avoid wasting or poor wear-resistant ability.

[0073] In some embodiments, the wear-resistant material comprises wear-resistant particles Al_2O_3 , wear-resistant particles WC or a mixture of wear-resistant particles Al_2O_3 and wear-resistant particles WC.

20 [0074] In some embodiments, the wear-resistant material comprises a mixture of wear-resistant particles Al_2O_3 and wear-resistant particles WC, and a mass fraction ratio of wear-resistant particles Al_2O_3 to wear-resistant particles WC in the mixture is 1:1 or 4:6.

[0075] In some embodiments, the matrix model comprises a first section 11 having a first line segment as well as a second section 12 and a third section 13 respectively located at the two sides of the first
25 section 11, the first line segment passes through the center of a circle of the matrix model and two end points of the first line segment are both located on the outer circle of the matrix model, and the step of coating the wear-resistant material on the wear-prone part of the matrix model comprises:

[0076] coating a first wear-resistant material in the first section 11 of the matrix model, and coating a second wear-resistant material in the second section 12 and the third section 13, wherein the types of the

first wear-resistant material and the second wear-resistant material are the same or different.

[0077] By coating different wear-resistant materials in different regions, different regions can have different wear-resistant abilities, it is not needed to coat all the regions according to the strongest wear resistance, so as to avoid wasting to improve the manufacturing cost.

5 [0078] In some embodiments, before the wear-resistant material is coated on the wear-prone part of the matrix model, the manufacturing method also comprises:

[0079] drying the wear-resistant material in an oven in advance, wherein the drying temperature is set as 180°C~300°C, heat preservation time is 1.5 h~3 h, and then cooling to room temperature; and

[0080] adding a liquid binding agent in the wear-resistant material.

10 [0081] The wear-resistant material is dried in advance, which can prevent the high water content of the wear-resistant material from affecting the stability when in coating. The dried wear-resistant material is cooled to room temperature, so as to avoid the adhesive ability of the binding agent when the binding agent is added in the future.

[0082] In some embodiments, the step of coating the wear-resistant material on the wear-prone part of
15 the matrix model comprises:

[0083] coating the wear-resistant material on the wear-prone part of the matrix model, wherein the coating thickness is larger than a preset thickness by 0.5 mm~ 1.5 mm, and the preset thickness is a thickness of a wear-resistant layer at a corresponding position of the cutting ring finished product.

[0084] By setting the coating thickness to a preset thickness of 0.5 mm~1 mm, such as 0.5 mm, 1 mm and
20 1.5 mm, some machining allowances can be reserved, and meanwhile improvement of wear resistance is facilitated.

[0085] In some embodiments, the coating thickness of the wear-resistant material is 4 mm~ 8mm.

[0086] In some embodiments, the step of pouring a molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, and the
25 cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material comprises:

[0087] raising the temperature of a furnace to 1500°C~1550°C to melt the matrix raw material liquid containing elements Fe, Cr, C and Mn, casting at a molten temperature of 1480°C~1520°C after the matrix raw material liquid is completely molten, wherein the matrix model is molten after encountering

the matrix raw material liquid, and the matrix raw material liquid and the wear-resistant material are integrated by casting;; and

[0088] obtaining a cutting ring blank when the casting is cooled to 840°C~900°C, and then further machining the cutting ring blank to obtain a cutting ring finished product.

5 [0089] The following describes the operation steps of some embodiments of the manufacturing method of the cutting ring for the concrete pump truck of the present disclosure:

[0090] In some embodiments, the manufacturing method of the cutting ring for the concrete pump truck comprises:

[0091] pretreatment of a wear-resistant composite: a raw material comprises one or two of wear-resistant
10 particles Al_2O_3 and WC with a particle size of 0.5 mm~2 mm, and the wear-resistant particles are put into an oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1 h~3 h, and then cooled to room temperature;

[0092] preparation of a wear-resistant composite: a liquid binding agent is added into the above wear-resistant particles and uniformly stirred, the resulting mixture is coated in the groove and radial inner side
15 surface and outer side surface of the matrix foam model of the cutting ring, the coating has a thickness of 4 mm~8mm, which is higher than the matrix plane by about 1 mm, and is used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite is coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser are reserved.

20 [0093] casting: an intermediate frequency furnace with a volume of 1 ton is used for melting, the matrix raw material is a metal solution mainly containing elements Fe, Cr, C and Mn, the temperature is raised to 1500°C~1550°C, and casting is performed at the temperature of 1480°C~1520°C after the metal solution is completely molten;

[0094] shakeout and cooling: when the casting is cooled to 840°C ~ 900°C, the sand is removed, the mold is
25 cleaned, and the cutting ring blank is obtained by natural cooling. When cooling, thermal insulation treatment is carried out; then, the cutting ring finished product is obtained by machining according to the requirements.

[0095] In the process of casting the cutting ring produced by the production and preparation method provided by the embodiment, a few of metal solution can be penetrated into the wear-resistant material, and therefore the wear-resistant coating comprises a wear-resistant composite formed by mixing wear-resistant

particles with Fe, Cr, C and Mn, the wear-resistant composite has a hardness of greater than 60HRC, a wear rate of less than 0.03% and bending strength of greater than 1700MPa, the wear-resistant layer is bond to the matrix through high-temperature casting to form a casting entirety, and is not easy to fall off.

[0096] Next, several examples of the cutting ring for the concrete pump truck of the present disclosure will be introduced:

[0097] In the first example, the manufacturing method of the cutting ring comprises the steps:

[0098] 1. pretreatment of a wear-resistant composite: a raw material comprised wear-resistant particles Al_2O_3 with a particle size of 0.5 mm~2 mm, and the wear-resistant particles were put into an oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1.5 h~3 h, and then cooled to room temperature;

[0099] 2. preparation of a wear-resistant composite: a liquid binding agent was added into the above wear-resistant particles Al_2O_3 and uniformly stirred, the resulting mixture was coated in the groove of the matrix foam model of the cutting ring, the coating had a thickness of 4 mm~8mm, which was higher than the matrix plane by about 1 mm, and was used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite was coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser were reserved;

[00100] 3. casting: an intermediate frequency furnace with a volume of 1 ton was used for melting, the matrix raw material was a metal solution mainly containing elements Fe, Cr, C and Mn, the temperature was raised to 1500°C~1550°C, and casting was performed at the temperature of 1480°C~1520°C after the metal solution was completely molten, and the matrix foam model of the cutting ring was molten by heating, and the metal solution was bond to the wear-resistant composite through high-temperature pouring to form a casting entirety;

[00101] 4. shakeout and cooling: when the casting was cooled to 840°C ~ 900°C, the sand was removed, the mold was cleaned, and the cutting ring blank was obtained by natural cooling. When cooling, thermal insulation treatment was carried out; and then, the cutting ring finished product was obtained by machining as required.

[00102] In the process of casting the cutting ring produced by the production and preparation method provided by the embodiment, a few of metal solution can be penetrated into the wear-resistant material, and therefore the wear-resistant coating comprises a wear-resistant composite formed by mixing wear-resistant particles Al_2O_3 with Fe, Cr, C and Mn, and the wear-resistant composite has a hardness of greater than 80HRC

and is suitable for granite sandstones.

[00103] In the second example, the manufacturing method of the cutting ring comprises the steps:

[00104] 1. pretreatment of a wear-resistant composite: a raw material comprised wear-resistant particles WC with a particle size of 0.5 mm~2 mm, and the wear-resistant particles were put into an oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1.5 h~3 h, and then cooled to room temperature;

[00105] 2. preparation of a wear-resistant composite: a liquid binding agent was added into the above wear-resistant particles WC and uniformly stirred, the resulting mixture was coated in the groove of the matrix foam model of the cutting ring, the coating had a thickness of 4 mm~8mm, which was higher than the matrix plane by about 1 mm, and was used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite was coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser were reserved;

[00106] 3. casting: an intermediate frequency furnace with a volume of 1 ton was used for melting, the matrix raw material was a metal solution mainly containing elements Fe, Cr, C and Mn, the temperature was raised to 1500°C~1550°C, and casting was performed at the temperature of 1480°C~1520°C after the metal solution was completely molten, and the matrix foam model of the cutting ring was molten by heating, and the metal solution was bond to the wear-resistant composite through high-temperature pouring to form a casting entirety;

[00107] 4. shakeout and cooling: when the casting was cooled to 840°C ~ 900°C, the sand was removed, the mold was cleaned, and the cutting ring blank was obtained by natural cooling. When cooling, thermal insulation treatment was carried out; and then, the cutting ring finished product was obtained by machining as required.

[00108] The cutting ring produced by the production and preparation method provided by the embodiment is used, the wear-resistant coating comprises a wear-resistant composite formed by mixing wear-resistant particles WC with Fe, Cr, C and Mn, and the wear-resistant composite has a hardness of greater than 65HRC and is suitable for a conventional limestone mixture.

[00109] In the third example, the manufacturing method of the cutting ring comprises the steps:

[00110] 1. pretreatment of a wear-resistant composite: a raw material comprised wear-resistant particles Al_2O_3 and wear-resistant particles WC, and the two wear-resistant particles respectively accounted for 50% by weight and had a particle size of 0.5 mm~2 mm, and the wear-resistant particles were put into an

oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1.5 h~3 h, and then cooled to room temperature;

[00111] 2. preparation of a wear-resistant composite: the above wear-resistant particles Al_2O_3 and wear-resistant particles WC were mixed, a liquid binding agent was added into the mixture and uniformly stirred, the resulting mixture was coated in the groove of the matrix foam model of the cutting ring, the coating had a thickness of 4 mm~8mm, which was higher than the matrix plane by about 1 mm, and was used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite was coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser were reserved;

[00112] 3. casting: an intermediate frequency furnace with a volume of 1 ton was used for melting, the matrix raw material was a metal solution mainly containing elements Fe, Cr, C and Mn, the temperature was raised to 1500°C~1550°C, and casting was performed at the temperature of 1480°C~1520°C after the metal solution was completely molten, and the matrix foam model of the cutting ring was molten by heating, and the metal solution was bond to the wear-resistant composite through high-temperature pouring to form a casting entirety;

[00113] 4. shakeout and cooling: when the casting was cooled to 840°C ~ 900°C, the sand was removed, the mold was cleaned, and the cutting ring blank was obtained by natural cooling. When cooling, thermal insulation treatment was carried out; and then, the cutting ring finished product was obtained by machining as required.

[00114] The cutting ring produced by the production and preparation method provided by the embodiment is used, the wear-resistant coating comprises a wear-resistant composite formed by mixing wear-resistant particles Al_2O_3 and WC with Fe, Cr, C and Mn, and the wear-resistant composite has a hardness of greater than 70HRC and is suitable for a conventional limestone and pebble sandstone mixture.

[00115] In the fourth example, the manufacturing method of the cutting ring comprises the steps:

[00116] 1. pretreatment of a wear-resistant composite: a raw material comprised wear-resistant particles Al_2O_3 and wear-resistant particles WC, and a mass fraction ratio of wear-resistant particles Al_2O_3 to wear-resistant particles WC was 4:6 and they had a particle size of 0.5 mm~2 mm, and the wear-resistant particles were put into an oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1.5 h~3 h, and then cooled to room temperature;

[00117] 2. preparation of a wear-resistant composite: the above wear-resistant particles Al_2O_3 and

wear-resistant particles WC were mixed, a liquid binding agent was added into the mixture and uniformly stirred, the resulting mixture was coated in the groove of the matrix foam model of the cutting ring, the coating had a thickness of 4 mm~8mm, which was higher than the matrix plane by about 1 mm, and was used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite was coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser were reserved.

[00118] 3. casting: an intermediate frequency furnace with a volume of 1 ton was used for melting, the matrix raw material was a metal solution mainly containing elements Fe, Cr, C and Mn, the temperature was raised to 1500°C~1550°C, and casting was performed at the temperature of 1480°C~1520°C after the metal solution was completely molten, and the matrix foam model of the cutting ring was molten by heating, and the metal solution was bond to the wear-resistant composite through high-temperature pouring to form a casting entirety;

[00119] 4. shakeout and cooling: when the casting was cooled to 840°C ~ 900°C, the sand was removed, the mold was cleaned, and the cutting ring blank was obtained by natural cooling. When cooling, thermal insulation treatment was carried out; and then, the cutting ring finished product was obtained by machining as required.

[00120] The cutting ring produced by the production and preparation method provided by the embodiment is used, the wear-resistant coating comprises a wear-resistant composite formed by mixing wear-resistant particles Al_2O_3 and WC with Fe, Cr, C and Mn, and the wear-resistant composite has a hardness of greater than 67HRC and is suitable for a conventional limestone and pebble sandstone mixture.

[00121] In the fifth example, the manufacturing method of the cutting ring comprises the steps:

[00122] 1. pretreatment of wear-resistant composite: a raw material comprised wear-resistant particles Al_2O_3 and wear-resistant particles WC, and had a particle size of 0.5 mm~2 mm, and the wear-resistant particles were put into an oven in advance to be dried at the temperature of 180°C~300°C, preserved for 1.5 h~3 h, and then cooled to room temperature;

[00123] 2. preparation of wear-resistant composite: a liquid binding agent was respectively added into the above wear-resistant particles Al_2O_3 and wear-resistant particles WC and uniformly stirred, the wear-resistant particles WC were coated in the groove of the matrix foam model of the cutting ring located in the first section 11, the wear-resistant particles Al_2O_3 were coated in the groove of the matrix foam model of the cutting ring located in the second section 12 and the third section 13, the coating had a thickness of 4 mm~8mm,

which was higher than the matrix plane by about 1 mm, and was used for machining allowance and strengthening wear resistance; the coated surface of the cutting ring model made of the wear-resistant composite was coated with casting paint, and then dried and put in a sand box in order, and a pouring gate and riser were reserved.

5 [00124] 3. casting: an intermediate frequency furnace with a volume of 1 ton was used for melting, the matrix raw material was a metal solution mainly containing elements such as Fe, Cr, C and Mn, the temperature was raised to 1500°C~1550°C, and casting was performed at the temperature of 1480°C~1520°C after the metal solution was completely molten, and the matrix foam model of the cutting ring was molten by heating, and the metal solution was bond to the wear-resistant composite through high-temperature pouring to form a casting
10 entirety;

[00125] 4. shakeout and cooling: when the casting was cooled to 840°C ~ 900°C, the sand was removed, the mold was cleaned, and the cutting ring blank was obtained by natural cooling. When cooling, thermal insulation treatment was carried out; and then, the cutting ring finished product was obtained by machining as required.

15 [00126] The cutting ring produced by the production and preparation method provided by the embodiment is used, the wear-resistant coating in the first section 11 comprises a wear-resistant composite formed by mixing wear-resistant particles WC with Fe, Cr, C and Mn, and the wear-resistant composite has a hardness of greater than 65HRC; the wear-resistant coating in the second section 12 and the third section 13 comprises a wear-resistant composite formed by mixing wear-resistant particles Al_2O_3 with Fe, Cr, C and Mn, the
20 wear-resistant composite has a hardness of greater than 80HRC and is suitable for comprehensive working condition of limestone and pebble sandstone.

[00127] Through description of a plurality of embodiments of the cutting ring for the concrete pump truck of the present disclosure and the manufacturing method thereof as well as the concrete pump truck, it can be seen that in the embodiments of the cutting ring for the concrete pump truck of the present disclosure and the
25 manufacturing method thereof as well as the concrete pump truck, the cutting ring is molded by inblock cast and firmly bond, and the cutting ring has better wear resistance and toughness, thereby solving the problem of alloy falling and avoiding the problem of early failure of the pump truck cutting ring caused by alloy falling, collapse and the like; in the manufacturing method, the processing processes such as billet blanking, surfacing, alloy groove opening, alloy plate matching, brazing and alloy surface grinding are omitted. The manufacturing

method is simple in processing process, high in production efficiency, low in comprehensive cost and high in overall cost performance, which brings users more choice space.

[00128] Finally, it should be noted that the above embodiments are only used for illustrating the technical solution of the present disclosure but not limiting the technical solution of the present disclosure; although the present disclosure is described in detail by reference to preferred embodiments, persons of ordinary skill in the art should understand that amendments can be also made to the specific embodiments of the present disclosure or equivalent replacements are made to partial technical features, these amendments and equivalent replacements are all comprised within the scope of the technical solution claimed by the present disclosure.

Claims:

1. A cutting ring for a concrete pump truck, comprising:
5 a ring-shaped matrix (10) comprising a wear-prone part; and
a wear-resistant layer arranged on the wear-prone part,
wherein the wear-resistant layer and the matrix (10) being integrally molded by casting.
2. The cutting ring for the concrete pump truck according to claim 1, wherein the wear-prone part
10 comprises a first end surface of the matrix (10) vertical to an axis direction of the matrix (10), the first end
surface is provided with a groove, the wear-resistant layer comprises a first wear-resistant layer (20), and the
first wear-resistant layer (20) is arranged in the groove.
3. The cutting ring for the concrete pump truck according to claim 2, wherein the groove is
15 arranged in the circumferential direction of the matrix (10), so that the first wear-resistant layer (20) is
of a ring shape.
4. The cutting ring for the concrete pump truck according to claim 1, wherein the wear-prone part
comprises a first ring surface of the matrix (10) on an inner circumferential side of the matrix (10) and
20 a second ring surface on an outer circumferential side of the matrix (10), the wear-resistant layer
comprise a second wear-resistant layer (30) and a third wear-resistant layer (40), the second
wear-resistant layer (30) is arranged on the inner side of the first ring surface, and the third
wear-resistant layer (40) is arranged on the outer side of the second ring surface.
- 25 5. The cutting ring for the concrete pump truck according to claim 4, wherein the wear-resistant
layer (30) and the third wear-resistant layer (40) are both of ring shapes.
6. The cutting ring for the concrete pump truck according to claim 1, wherein the matrix (10)
comprises a first section (11) having a first line segment, a second section (12) and a third section (13)

which are respectively located at the two sides of the first section (11), the first line segment passes through the center of a circle of the matrix (10) and two end points of the first line segment are both located on a circumference of the matrix (10), the type of the material of the wear-resistant layer located in the first section (11) is the same as or different from the type of the material of the wear-resistant layer located in the second section (12), and the type of the material of the wear-resistant layer located in the first section (11) is the same as or different from the type of the material of the wear-resistant layer located in the third section (13).

7. The cutting ring for the concrete pump truck according to claim 6, wherein the type of the material of the wear-resistant layer located in the second section (12) is the same as or different from the type of the material of the wear-resistant layer located in the third section (13).

8. The cutting ring for the concrete pump truck according to claim 6, wherein the total arc length of the first section (11) is larger than a sum of the arc length of the second section (12) and the arc length of the third section (13).

9. The cutting ring for the concrete pump truck according to claim 6, wherein the total arc length of the first section (11) is as twice as a sum of the arc length of the second section (12) and the arc length of the third section (13).

10. A concrete pump truck, comprising the cutting ring for the concrete pump truck according to any one of claims 1 to 9.

11. A manufacturing method of a cutting ring for a concrete pump truck, comprising:
providing a ring-shaped matrix model and a wear-resistant material;
coating the wear-resistant material on a wear-prone part of the matrix model; and
pouring a molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, and the cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material.

12. The manufacturing method of the cutting ring for the concrete pump truck according to claim 11, wherein the wear-resistant material comprises wear-resistant particles Al_2O_3 , wear-resistant particles WC or a mixture of wear-resistant particles Al_2O_3 and wear-resistant particles WC.

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13. The manufacturing method of the cutting ring for the concrete pump truck according to claim 11, wherein the wear-resistant material comprises a mixture of wear-resistant particles Al_2O_3 and wear-resistant particles WC, and a mass fraction ratio of wear-resistant particles Al_2O_3 to wear-resistant particles WC in the mixture is 1:1 or 4:6.

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14. The manufacturing method of the cutting ring for the concrete pump truck according to claim 11, wherein the matrix model comprises a first section (11) having a first line segment as well as a second section (12) and a third section (13) respectively located at the two sides of the first section (11), the first line segment passes through the center of a circle of the matrix model and two end points of the first line segment are both located on a circumference of the matrix model, and the step of coating the wear-resistant material on the wear-prone part of the matrix model comprises:

coating a first wear-resistant material on the first section (11) of the matrix model, and coating a second wear-resistant material on the second section (12) and the third section (13), wherein the types of the first wear-resistant material and the second wear-resistant material are the same or different.

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15. The manufacturing method of the cutting ring for the concrete pump truck according to claim 11, wherein before the wear-resistant material is coated on the wear-prone part of the matrix model, the manufacturing method also comprises:

drying the wear-resistant material in an oven in advance, wherein the drying temperature is set as $180^\circ\text{C}\sim 300^\circ\text{C}$, heat preservation time is 1.5 h~3 h, and then cooling to room temperature; and adding a liquid binding agent in the wear-resistant material.

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16. The manufacturing method of the cutting ring for the concrete pump truck according to claim 11, wherein the step of coating the wear-resistant material on the wear-prone part of the matrix model

comprises:

coating the wear-resistant material on the wear-prone part of the matrix model, wherein the coating thickness is larger than a preset thickness by 0.5 mm~ 1.5 mm, and the preset thickness is a thickness of a wear-resistant layer at a corresponding position of the cutting ring finished product.

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17. The manufacturing method of the cutting ring for the concrete pump truck according to claim 16, wherein the coating thickness of the wear-resistant material is 4 mm~ 8mm.

18. The manufacturing method of the cutting ring for the concrete pump truck according to claim 10 11, wherein the step of pouring a molten matrix raw material liquid into the matrix model coated with the wear-resistant material, wherein the matrix model is molten by heating, and the cutting ring is integrally molded by casting the matrix raw material liquid and the wear-resistant material comprises:

raising a temperature of a furnace to 1500°C~1550°C to melt a matrix raw material liquid containing elements Fe, Cr, C and Mn, and casting at a molten temperature of 1480°C~1520°C after 15 the matrix raw material liquid is completely molten, wherein the matrix model is molten after encountering the matrix raw material liquid, and the matrix raw material liquid and the wear-resistant material are integrated by casting; and

obtaining a cutting ring blank when the casting is cooled to 840°C~900°C, and then further machining to obtain a cutting ring finished product.

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