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(54) **SAW-TOOTHED ELECTROPLATED DIAMOND GRINDING TOOL**

(57) The present invention relates to the technical field of diamond cutting abrasive tools, and in particular to a serrated electroplated diamond abrasive tool, comprising an abrasive tool body and a holding member; the abrasive tool body is mounted on the holding member; the abrasive tool body is formed by at least one serrated substrate; the serrated surface of the substrate comprises inclined surfaces; the inclined surfaces are plated with diamond layers; the diamond layers are single layers in the normal direction of the inclined surfaces; the areas, where diamond particles are to be plated, on the inclined surfaces are electroplated layers; the diamond particles in the diamond layers are encased and plated in the electroplated layers; a groove is formed between every two adjacent serrations on each substrate, and the plurality of grooves in each layer of substrate and the plurality of grooves in an adjacent layer of substrate are combined and communicated to form a tooth plate water channel. The present invention is advantageous to prefabricate abrasive tools, and meet different demands for abrasive tools by means of combination and assembly, the process of manufacturing abrasive tools by electroplating is

simplified, and some of brazing process diamond abrasive tools and powder metallurgy process diamond abrasive tools are replaced.

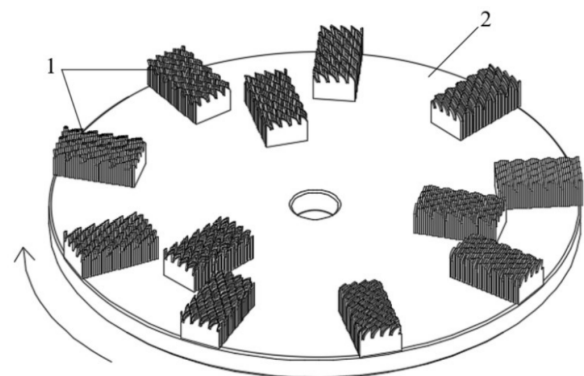


FIG. 1

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Description

TECHNICAL FIELD

[0001] The disclosure relates to the technical field of diamond cutting abrasive tools, and in particular to a serrated electroplated diamond abrasive tool.

BACKGROUND

[0002] Electroplated diamond abrasive tools are generally of a single-layer surface-mounted type (characterized by: all working diamonds in the diamond working layer are on the same rotation working surface and participate in the work together), i.e., the thickness of the electroplated metal layer is less than the particle size of the diamonds, and the diamonds present less than 1/2 of their particle size lying on the same rotation working surface. When the abrasive tool is initially used, due to the sharp corners of the diamond particles, the sharpness of the abrasive tool is extremely high. However, as the sharp corners of the diamond particles wear and become blunt, the contact surface area between the diamond particles and the workpiece increases quadratically. At this time, the force required for grinding and cutting the workpiece material will increase significantly; otherwise, the pressure required for cutting will decrease significantly, and the sharpness of the abrasive tool will decrease quadratically. However, increasing the force requires higher equipment power and the workpiece must have sufficient strength; otherwise, the abrasive tool will fail. Single-layer brazed diamond tools also have similar problems mentioned above, and the brazing process is cumbersome for complex shapes. The sharpness of powder metallurgy sintered diamond abrasive tools is difficult to exceed that of electroplated diamond abrasive tools.

SUMMARY OF THE INVENTION

[0003] The object of the present disclosure is to provide a serrated electroplated diamond abrasive tool to solve the above problems.

[0004] The technical solution adopted by the present disclosure to solve the above technical problems is as follows: a serrated electroplated diamond abrasive tool, comprising: an abrasive tool body and a holding member, wherein the abrasive tool body is mounted on the holding member, the abrasive tool body is composed of at least one serrated substrate, the serrated surface of the substrate comprises an inclined surface, a diamond layer is plated on the inclined surface, the diamond layer is arranged in a single layer in the normal direction of the inclined surface, the area on the inclined surface where diamond particles are to be plated is provided with an electroplated layer, the diamond particles in the diamond layer are encased and plated in the electroplated layer, and in the normal direction of the inclined surface, the

thickness of the electroplated layer is greater than the particle size of the diamond particles; when the abrasive tool body is formed by stacking a plurality of the substrates, grooves are formed between two adjacent serrations on the substrate, and the plurality of grooves on each layer of the substrate are combined and communicated with the plurality of grooves on an adjacent layer of the substrate to form a tooth plate water channel.

[0005] The beneficial effects of the present disclosure include: the serrated substrate is conducive to achieving intermittent grinding and optimizing chip removal; the single-layer diamond layer is conducive to improving the self-sharpening property of the diamond layer; the diamond particles are encased and plated in the electroplated layer, and the thickness of the electroplated layer is greater than the particle size of the diamond particles, which is conducive to ensuring the holding force of the electroplated layer on the diamond particles and improving the service life of the diamonds; the tooth plate water channel is conducive to establishing an internal cooling manner, optimizing the cooling effect during grinding, and this structure also achieves a good chip removal effect. The embodiments of the present disclosure can prefabricate components and meet different market demands for abrasive tools and sawing tools through combined assembly, making the abrasive tools suitable for efficient processing, optimizing processing quality, and at the same time, can partially replace brazed diamond abrasive tools and powder metallurgy diamond abrasive tools, improving sharpness and service life, and reducing manufacturing costs.

[0006] On the basis of the above technical solution, the present invention can be further improved as follows.

[0007] Further, on the inclined surface of a single serration of the substrate, the difference in the wear direction of the abrasive tool during operation between any two points spaced by one time the particle size of the diamond particles in the rotation direction is greater than or equal to 1/4 of the particle size of the diamond particles and less than or equal to 1/2 of the particle size of the diamond particles.

[0008] The beneficial effects of adopting the above further solution are that it is conducive to adjusting the abrasive tool to have stable self-sharpening property, service life and sharpness.

[0009] Further, when the abrasive tool body is a single substrate, the diamond particles are arranged in a single row, multiple rows, a staggered single row or staggered multiple rows in the axial direction of the inclined surface, and the axial arrangement width of each row of diamond particles in the axial direction of the inclined surface is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.

[0010] The beneficial effects of adopting the above further solution are that it is conducive to adapting to different working conditions according to various embodiments, reducing unnecessary wear of diamond parti-

cles, reducing working load, adjusting service life, self-sharpening property and sharpness performance, and is conducive to increasing the pressure of a single diamond particle by reducing the concentration of diamond particles.

[0011] Further, when the abrasive tool body is formed by stacking a plurality of the substrates, the diamond particles are arranged in a single row, multiple rows, a staggered single row or staggered multiple rows on the inclined surfaces in the stacking direction of the plurality of substrates, each row of diamond particles is parallel to the rotation or movement trajectory of the diamond particles, and the arrangement width of each row of diamond particles in the stacking direction of the plurality of substrates is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.

[0012] The beneficial effects of adopting the above further solution are that it is conducive to adapting to different working conditions according to various embodiments, reducing unnecessary wear of diamond particles, reducing working load, adjusting service life, self-sharpening property and sharpness performance, and is conducive to increasing the pressure of a single diamond particle by reducing the concentration of diamond particles.

[0013] Further, when the diamond particles are arranged in multiple rows or staggered multiple rows on the inclined surface, an area between two adjacent rows of diamond particles where no diamond particles are plated is a blank plated layer, and the width of the blank plated layer is greater than zero and less than two times the particle size of the diamond particles.

[0014] The beneficial effects of adopting the above further solution are that the blank plated layer will be preferentially worn to form grooves during the use of the abrasive tool, which are communicated to the tooth plate water channels to form a micro-structured grid cooling and chip removal mode, and at the same time the blank plate layer plays a centering role, reducing the risk of edge chipping, enhancing mechanical crushing, and reducing the working load of the abrasive tool.

[0015] Further, the abrasive tool body is mounted on the outer circumferential surface or end face of the holding member; when the abrasive tool body is mounted on the outer circumferential surface of the holding member, the substrate is an annular structure with the inclined surface arranged on its outer circumferential surface; when the abrasive tool body is mounted on the end face of the holding member, the substrate is a sheet-like structure or an annular structure with the inclined surface arranged on its top end.

[0016] The beneficial effects of adopting the above further solution are that it is conducive to prefabricating components and meeting different market demands for abrasive tools and sawing tools through combined assembly, manufacturing end face working surface abrasive tools, peripheral working surface abrasive tools, or

composite working surface abrasive tools combining both, which is suitable for large-scale manufacturing and automated assembly of abrasive tools of various uses, specifications and shapes.

[0017] Further, when the abrasive tool body is formed by stacking a plurality of the substrates, the abrasive tool body is mounted on the outer circumferential surface of the holding member, and the inclined surface is arranged on the outer circumferential surface of the substrate, the plurality of substrates are stacked up and down to form the abrasive tool body.

[0018] The beneficial effects of adopting the above further solution are that it is conducive to stacking a plurality of substrates into an abrasive tool with the outer circumferential surface as the working surface, improving the applicability of the product, and the substrates can be assembled into an abrasive tool with a special-shaped working surface.

[0019] Further, the holding member comprises a central column, a plurality of clamping blocks and two cover plates, the plurality of clamping blocks are arranged around the periphery of the central column, the two cover plates are respectively arranged at the top and bottom ends of the central column and the clamping blocks, the abrasive tool body is arranged between the two cover plates, a plurality of anti-rotation clamping grooves are provided on the inner side of the substrate, the anti-rotation clamping grooves are arc-shaped groove structures, the plurality of anti-rotation clamping grooves are respectively clamped with one end of the plurality of clamping blocks far away from the central column, a spiral water channel is formed between the anti-rotation clamping grooves and the clamping blocks, and the spiral water channel comprises a plurality of arc-shaped groove structures arranged in parallel up and down.

[0020] The beneficial effects of adopting the above further solution are that it is conducive to improving the holding force on the substrate and optimizing the cooling effect of the abrasive tool.

[0021] Further, when the abrasive tool body is mounted on the end face of the holding member, and the substrate is a sheet-like structure with the inclined surface arranged on its top end, a plurality of the substrates are stacked to form an abrasive tool unit, and a plurality of the abrasive tool units are arranged circumferentially on the end face of the holding member to form the abrasive tool body.

[0022] The beneficial effects of adopting the above further solution are that it is conducive to stacking a plurality of substrates into an abrasive tool with the end face as the working surface, improving the applicability of the product.

[0023] Further, when the abrasive tool body is mounted on the end face of the holding member, and the substrate is an annular structure with the inclined surface arranged on its top end, a plurality of the substrates are stacked inside and outside to form the abrasive tool body.

[0024] The beneficial effects of adopting the above

further solution are that it is conducive to stacking a plurality of substrates inside and outside to form an abrasive tool with its end face acting as the working surface, thereby improving the applicability of the product.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Fig. 1 is a schematic diagram of an overall structure provided in Embodiment 1 of the present invention;
Fig. 2 is a schematic diagram of a structure of the abrasive tool unit provided in Embodiment 1 of the present invention;

Fig. 3 is an enlarged schematic diagram of an area N in the structure shown in Fig. 2;

Fig. 4 is a schematic diagram of the structure of a single substrate provided in Embodiment 1 of the present invention;

Fig. 5 is a front view of a single substrate provided in Embodiment 1 of the present invention;

Fig. 6 is an enlarged schematic diagram of an area P in the structure shown in Fig. 5;

Fig. 7 is a schematic diagram of an overall structure provided in Embodiment 2 of the present invention;

Fig. 8 is an enlarged schematic diagram of an area R in the structure shown in Fig. 7;

Fig. 9 is a schematic diagram of an internal structure provided in Embodiment 2 of the present invention;

Fig. 10 is an enlarged schematic diagram of an area Q in the structure shown in Fig. 9;

Fig. 11 is a top view of the overall structure provided in Embodiment 2 of the present invention;

Fig. 12 is a structural diagram cut along the section line A-A in the structure shown in Fig. 11;

Fig. 13 is a top view of the single substrate provided in Embodiment 2 of the present invention;

Fig. 14 is a structural diagram cut along the section line B-B in the structure shown in Fig. 13;

Fig. 15 is an enlarged schematic diagram of an area S in the structure shown in Fig. 14;

Fig. 16 is a schematic diagram of an overall structure provided in Embodiment 3 of the present invention;

Fig. 17 is a front view of the overall structure provided in Embodiment 3 of the present invention;

Fig. 18 is a top view of the overall structure provided in Embodiment 3 of the present invention;

Fig. 19 is a top view of an overall structure provided in Embodiment 4 of the present invention;

Fig. 20 is an enlarged schematic diagram of an area M in the structure shown in Fig. 19;

Fig. 21 is a structural diagram cut along the section line C-C in the structure shown in Fig. 19;

Fig. 22 is a schematic diagram of the structure of the abrasive tool body provided in Embodiment 4 of the present invention;

Fig. 23 is an enlarged schematic diagram of an area

L in the structure shown in Fig. 22;

Fig. 24 is a side view of a single substrate provided in Embodiment 5 of the present invention;

Fig. 25 is an enlarged schematic diagram of an area I in the structure shown in Fig. 24;

Fig. 26 is an enlarged schematic diagram of an area U in the structure shown in Fig. 13;

Fig. 27 is an enlarged schematic diagram of an area V in the structure shown in Fig. 13;

Fig. 28 is a side view of a single substrate provided in Embodiment 6 of the present invention;

Fig. 29 is an enlarged schematic diagram of an area T in the structure shown in Fig. 28;

Fig. 30 is a side view of a single substrate provided in Embodiment 7 of the present invention;

Fig. 31 is an enlarged schematic diagram of an area K in the structure shown in Fig. 30;

Fig. 32 is a side view of a single substrate provided in Embodiment 8 of the present invention;

Fig. 33 is an enlarged schematic diagram of an area O in the structure shown in Fig. 32.

[0026] Wherein, the arrows in Figs. 1, 11 and 19 indicate the rotation direction of the abrasive tool; the arrows in Figs. 12, 15, 20 and 23 indicate the flow path of cooling water; B in Figs. 25 and 29 indicates the axial arrangement width of a single row of diamond particles; B1 in Fig. 29 indicates the width of the blank plated layer; b in Figs. 25, 26 and 27 indicates the particle size of diamond particles; b2 in Fig. 31 indicates the thickness of the saw blade substrate; R and R1 in Fig. 27 indicate the radii of any two points spaced by one time the particle size in the rotation direction on the inclined surface of a single serration of the substrate; b1 in Fig. 27 indicates the thickness of the electroplated layer in the normal direction of the inclined surface of the serration.

[0027] In the drawings, the list of components represented by each reference numeral is as follows:

1. Abrasive tool body; 2. Holding member; 11. Substrate; 12. Inclined surface; 13. Diamond layer; 14. Tooth plate water channel; 15. Spiral water channel; 16. Anti-rotation clamping groove; 21. Central column; 22. Clamping block; 23. Cover plate; 121. Electroplated layer; 122. Blank plated layer.

DETAILED DESCRIPTION OF EMBODIMENTS

[0028] The principles and features of the present invention will be described below, and the examples given are only used to explain the present disclosure and are not intended to limit the scope of the present invention.

[0029] As shown in Figs. 1 to 33, a serrated electroplated diamond abrasive tool comprises an abrasive tool body 1 and a holding member 2, the abrasive tool body 1 is mounted on the holding member 2, the abrasive tool body 1 is composed of at least one serrated substrate 11, the serrated surface of the substrate 11 comprises an inclined surface 12, a diamond layer 13 is plated on the

inclined surface 12, the diamond layer 13 is arranged in a single layer in the normal direction of the inclined surface 12, the area on the inclined surface 12 where diamond particles are to be plated is provided with an electroplated layer 121, the diamond particles in the diamond layer 13 are encased and plated in the electroplated layer 121, and in the normal direction of the inclined surface 12, the thickness b1 of the electroplated layer 121 is greater than the particle size b of the diamond particles; when the abrasive tool body 1 is formed by stacking a plurality of the substrates 11, grooves are formed between two adjacent serrations on the substrate 11, and the plurality of grooves on each layer of the substrate 11 are combined and communicated with the plurality of grooves on an adjacent layer of the substrate 11 to form a tooth plate water channel 14.

[0030] It should be noted that: the diamond working layer refers to all diamond particles in the diamond layer 13 on the inclined surface 12 including the diamond particles that are in contact with the workpiece and diamond particles that will participate in grinding the workpiece one by one with abrasion in use;

When the abrasive tool body 1 is a single substrate 11 and uses the outer circumferential surface as the working surface, the abrasive tool body 1 works like a saw blade.

[0031] The beneficial effects of the present invention include: the serrated substrate is conducive to achieving intermittent grinding and optimizing chip removal, the single-layer diamond layer is conducive to improving the self-sharpening property of the diamond layer, the diamond particles are encased and plated in the electroplated layer, and the thickness of the electroplated layer is greater than the particle size of the diamond particles, which is conducive to ensuring the holding force of the electroplated layer on the diamond particles and improving the service life of the diamonds. The tooth plate water channel is conducive to establishing an internal cooling manner, optimizing the cooling effect during grinding, and this structure also achieves a good chip removal effect. The present invention can prefabricate components and combine and assemble the components to meet different market demands for abrasive tools and sawing tools, making the abrasive tools suitable for efficient processing, optimizing processing quality, and at the same time, can partially replace brazed diamond abrasive tools and powder metallurgy diamond abrasive tools, improving sharpness and service life, and reducing manufacturing costs.

[0032] Preferably, as shown in Fig. 27, on the inclined surface 12 of a single serration of the substrate 11, the difference R-R1 in the wear direction of the abrasive tool during operation between any two points spaced by one time the particle size b of the diamond particles in the rotation direction is greater than or equal to 1/4 of the particle size b of the diamond particles and less than or equal to 1/2 of the particle size b of the diamond particles.

[0033] It should be noted that the wear direction of the abrasive tool during operation refers to the axial direction

when the abrasive tool body is arranged on the end face of the holding member; and refers to the radial direction when the abrasive tool body is arranged on the outer circumferential surface of the holding member.

[0034] The beneficial effects of adopting the above further solution are that it is conducive to adjusting the abrasive tool to have stable self-sharpening property, service life and sharpness.

[0035] Preferably, as shown in Figs. 24 to 33, when the abrasive tool body 1 is a single substrate 11, the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows in the axial direction of the inclined surface 12. The axial arrangement width B of each row of diamond particles in the axial direction of the inclined surface 12 is greater than one time the particle size b of the diamond particles and less than twice the particle size b of the diamond particles.

[0036] The beneficial effects of adopting the above further solution are that it is conducive to adapting to different working conditions according to various embodiments, reducing unnecessary wear of diamond particles, reducing working load, adjusting service life, self-sharpening property and sharpness performance, and it is also advantageous to increasing the pressure of single diamond particles by reducing the concentration of diamond particles.

[0037] Preferably, as shown in Figs. 1 to 23, when the abrasive tool body 1 is formed by stacking multiple substrates 11, the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows on the inclined surfaces 12 in the stacking direction of the multiple substrates 11. Each row of diamond particles is parallel to the rotation or movement trajectory of the diamond particles. The arrangement width B of each row of diamond particles in the stacking direction of the multiple substrates 11 is greater than one time the particle size b of the diamond particles and less than twice the particle size b of the diamond particles.

[0038] It should be noted that the rotation or movement trajectory of the diamond particles refers to the direction of rotation of the diamond particles arranged on the inclined surface 12 along with the entire abrasive tool when the entire abrasive tool rotates, as indicated by the arrows in Figs. 1, 11 and 19.

[0039] Since some of the diamond particles will project out of the electroplated layer 121 when the diamond particles are plated on the electroplated layer 121, the arrangement width B of a single row of diamond particles in the stacking direction of the multiple substrates 11 refers to the distance between the top of the uppermost diamond particle and the bottom of the lowermost diamond particle in a range of a row of diamond particles formed by plating of one electroplated layer 121, as shown in Figs. 25 and 29.

[0040] The beneficial effects of adopting the above preferred scheme are that it is conducive to adapting to different working conditions according to various em-

bodiments, reducing unnecessary wear of diamond particles, reducing working load, adjusting service life, self-sharpening property and sharpness performance, and it is also advantageous to increasing the pressure of single diamond particles by reducing the concentration of diamond particles.

[0041] Preferably, as shown in Fig. 29, when the diamond particles are arranged in multiple rows or staggered multiple rows on the inclined surface 12, an area between two adjacent rows of diamond particles where no diamond particles are plated is a blank plated layer 122. The width B1 of the blank plated layer 122 is greater than zero and less than twice the particle size b of the diamond particles.

[0042] It should be noted that the width B1 of the blank plated layer 122 refers to the distance between the bottom of the lowermost diamond particle in the upper row of diamond particles and the top of the uppermost diamond particle in the lower row of diamond particles for two adjacent rows of diamond particles.

[0043] When the diamond particles are arranged in staggered multiple rows on the inclined surface 12 in the stacking direction of the multiple substrates 11 and the number of rows is two, there is no blank plated layer 122, as shown in Fig. 31, which is a special case, and the details can be found in Embodiment 7 below.

[0044] The beneficial effects of adopting the above preferred scheme are that the blank plated layer will be preferentially worn to form grooves during the use of the abrasive tool and communicated with the tooth plate water channels to form a micro-structured grid cooling and chip removal mode; at the same time, it plays a centering role, reduces the risk of edge chipping, enhances mechanical crushing, and reduces the working load of the abrasive tool.

[0045] Preferably, as shown in Figs. 1 to 23, the abrasive tool body 1 is mounted on the outer circumferential surface or end face of the holding member 2. When the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, the substrate 11 is an annular structure with the inclined surfaces 12 arranged on its outer circumferential surface; when the abrasive tool body 1 is mounted on the end face of the holding member 2, the substrate 11 is a sheet-like structure or an annular structure with the inclined surfaces 12 arranged on its top end.

[0046] The beneficial effects of adopting the above preferred solution are that it is conducive to prefabricating components and meeting different market demands for abrasive tools and sawing tools by combining and assembling the components, conducive to fabricating end face working surface abrasive tools, peripheral working surface abrasive tools, or composite working surface abrasive tools combining both, and is suitable for large-scale manufacture and automated assembly of abrasive tools with various uses, specifications and shapes.

[0047] Preferably, as shown in Figs. 7 to 18, when the

abrasive tool body 1 is formed by stacking multiple substrates 11, and the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, and the inclined surfaces 12 are arranged on the outer circumferential surface of the substrate 11, the multiple substrates 11 are stacked up and down to form the abrasive tool body 1.

[0048] It should be noted that when the multiple substrates 11 are stacked up and down to form the abrasive tool body 1, the diameters of the multiple substrates 11 can be the same, thus forming an abrasive tool with an outer contour like a cylindrical surface, as shown in Fig. 7; the diameters can also be different, thus forming an abrasive tool with an outer contour like a curved cylindrical surface, as shown in Fig. 16.

[0049] The beneficial effects of adopting the above preferred solution are that it is conducive to stacking multiple substrates into an abrasive tool with the outer circumferential surface as the working surface, improving the applicability of the product, and the substrates can be combined and assembled into an abrasive tool with a special-shaped working surface.

[0050] Preferably, as shown in Figs. 7 to 15, the holding member 2 includes a central column 21, a plurality of clamping blocks 22 and two cover plates 23. The plurality of clamping blocks 22 are arranged around the periphery of the central column 21. The two cover plates 23 are respectively arranged at the top and bottom ends of the central column 21 and the clamping blocks 22. The abrasive tool body 1 is arranged between the two cover plates 23. A plurality of anti-rotation clamping grooves 16 are arranged on the inner side of the substrate 11. The anti-rotation clamping grooves 16 are arc-shaped groove structures. The plurality of anti-rotation clamping grooves 16 are clamped to the ends of the plurality of clamping blocks 22 away from the central column 21 in one-to-one correspondence. A spiral water channel 15 is formed between the anti-rotation clamping grooves 16 and the clamping blocks 22. The spiral water channel 15 is a plurality of arc-shaped groove structures arranged in parallel up and down.

[0051] It should be noted that since the anti-rotation clamping grooves 16 are all arc-shaped groove structures, when the plurality of anti-rotation clamping grooves 16 are clamped to the plurality of clamping blocks 22 in one-to-one correspondence, a channel for cooling water to flow through, namely the spiral water channel 15, is formed between the clamping blocks 22 and the anti-rotation clamping grooves 16. The flow path of the cooling water is as follows: cooling water is injected from the water inlet channel as shown in Fig. 12, enters between two adjacent clamping blocks 22, then enters the spiral water channel 15, and finally is discharged from the tooth plate water channel 14 between two adjacent serrations, as shown in Fig. 15.

[0052] The beneficial effects of adopting the above preferred solution are that it is conducive to improving the holding force on the substrate and optimizing the

cooling effect of the abrasive tool.

[0053] Preferably, as shown in Figs. 1 to 6, when the abrasive tool body 1 is mounted on the end face of the holding member 2, and the substrate 11 is a sheet-like structure with the inclined surfaces 12 on its top end, multiple substrates 11 are stacked to form an abrasive tool unit, and multiple abrasive tool units are arranged circumferentially on the end face of the holding member 2 to form the abrasive tool body 1.

[0054] The beneficial effects of adopting the above preferred solution are that it is conducive to stacking multiple substrates into an abrasive tool with the end face as the working surface, and improving the applicability of the product.

[0055] Preferably, as shown in Figs. 19 to 23, when the abrasive tool body 1 is mounted on the end face of the holding member 2, and the substrate 11 is an annular structure with the inclined surfaces 12 arranged on its top end, multiple substrates 11 are stacked inside and outside to form the abrasive tool body 1.

[0056] The beneficial effects of adopting the above preferred solution are that it is conducive to stacking multiple substrates in an inside-outside stacking manner to form an abrasive tool with the end face acting as the working surface, improving the applicability of the product.

[0057] The present invention will be further described below through several embodiments:

Embodiment 1

[0058] As shown in Figs. 1 to 6, the abrasive tool body 1 is formed by stacking multiple substrates 11, the abrasive tool uses the end face as the working surface, the substrates 11 are sheet-like structures, the abrasive tool body 1 is mounted on the end face of the holding member 2, multiple substrates 11 are stacked to form an abrasive tool unit, and multiple abrasive tool units are arranged circumferentially on the end face of the holding member 2 to form the abrasive tool body 1.

Embodiment 2

[0059] As shown in Figs. 7 to 15, the abrasive tool body 1 is formed by stacking multiple substrates 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrates 11 are annular structures, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, and multiple substrates 11 are stacked up and down with the same diameter to form the abrasive tool body 1.

Embodiment 3

[0060] As shown in Figs. 16 to 18, the abrasive tool body 1 is formed by stacking multiple substrates 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrates 11 are annular struc-

tures, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, and multiple substrates 11 are stacked up and down with different diameters to form the abrasive tool body 1.

Embodiment 4

[0061] As shown in Figs. 19 to 23, the abrasive tool body 1 is formed by stacking multiple substrates 11, the abrasive tool uses the end face as the working surface, the substrates 11 are annular structures, the abrasive tool body 1 is mounted on the end face of the holding member 2, and multiple substrates 11 are stacked inside and outside to form the abrasive tool body 1.

[0062] On the basis of Embodiments 1 to 4, the diamond particles are arranged on the inclined surface 12 in a single row, multiple rows, a staggered single row, or staggered multiple rows in the stacking direction of the multiple substrates 11.

Embodiment 5

[0063] As shown in Figs. 24 and 25, the abrasive tool body 1 is a single substrate 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrate 11 is an annular structure, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, the diamond particles are arranged in a single row in the axial direction of the inclined surface 12, and there is no blank plated layer 122.

Embodiment 6

[0064] As shown in Figs. 28 and 29, the abrasive tool body 1 is a single substrate 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrate 11 is an annular structure, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, the diamond particles are arranged in two rows in the axial direction of the inclined surface 12; that is, in the axial direction of the substrate 11, two electroplated layers 121 are respectively arranged at the upper and lower ends of the inclined surface 12 of a single serration of the substrate 11, with a non-electroplated insulating area existing between the two electroplated layers 121, and there is a blank plated layer 122.

Embodiment 7

[0065] As shown in Figs. 30 and 31, the abrasive tool body 1 is a single substrate 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrate 11 is an annular structure, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, the diamond particles are arranged in a staggered two-row manner in the axial direction of the inclined surface 12; that is, in the axial direction

of the substrate 11, on the inclined surface 12 of one serration of the substrate 11, the upper half is an electroplated layer 121 and the lower half is a non-electroplated insulating area, and on the inclined surface 12 of an adjacent serration, the lower half is an electroplated layer 121 and the upper half is a non-electroplated insulating area, with no blank plated layer 122. In this embodiment, since the electroplated layers 121 are alternately arranged on the inclined surfaces 12 of the serrations, when the diamond particles are plated on the electroplated layers 121, the parts of the diamond particles protruding from the electroplated layers 121 are alternately arranged on the circumference of the saw blade, improving the stability of the saw blade during operation.

Embodiment 8

[0066] As shown in Figs. 32 and 33, the abrasive tool body 1 is a single substrate 11, the abrasive tool uses the outer circumferential surface as the working surface, the substrate 11 is an annular structure, the abrasive tool body 1 is mounted on the outer circumferential surface of the holding member 2, the diamond particles are arranged in staggered multiple rows in the axial direction of the inclined surface 12; that is, in the axial direction of the substrate 11, the structure as shown in Embodiment 6 is arranged on the inclined surface 12 of one serration of the substrate 11, and on the inclined surface 12 of an adjacent serration, the electroplated layer 121 is arranged in the middle of the inclined surface 12, with two non-electroplated insulating areas respectively arranged at the upper and lower ends of the electroplated layer 121, and there is a blank plated layer 122 (not shown). In this embodiment, since the electroplated layers 121 are alternately arranged on the inclined surfaces 12 of the serrations, when the diamond particles are plated on the electroplated layers 121, the parts of the diamond particles protruding from the electroplated layers 121 are alternately arranged on the circumference of the saw blade, improving the stability of the saw blade during operation.

Beneficial effects of the embodiments of the present invention:

[0067] The grinding effect is achieved through sawing, with high sharpness and low load; the serration structure realizes embedded mounting mode of single-layer diamonds (characteristic: most diamonds in the diamond working layer are not on the same rotation working surface in the wear direction, and gradually participate in work as wear progresses), solving the problem that single-layer electroplated diamond abrasive tools are prone to a square-level increase in load; through the structural design, internal cooling and micro-structured grid chip removal and cooling are realized, suitable for heavy-cut rough grinding; it is beneficial to manufacture the substrate by stamping, reducing manufacture cost; it is ben-

eficial to prefabricate in a simple way and meet different market demands for abrasive tools through combined assembly; it is beneficial to simplify the process of manufacturing abrasive tools by electroplating, reducing environmental protection difficulties; it can replace some brazed diamond abrasive tools and powder metallurgy diamond abrasive tools; it is suitable for automated manufacturing.

[0068] In the description of the present invention, it should be understood that the terms "center", "longitudinal", "transverse", "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counterclockwise", "axial", "radial", "circumferential" and the like indicate orientations or positional relationships based on the orientations or positional relationships shown in the drawings, which are only for the convenience of describing the present invention and simplifying the description, rather than indicating or implying that the referred device or element must have a specific orientation, be constructed and operated in a specific orientation, and thus cannot be understood as a limitation to the present invention.

[0069] In addition, the terms "first" and "second" are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features defined with "first" and "second" may explicitly or implicitly include at least one such feature. In the description of the present invention, "plurality" means at least two, such as two, three, etc., unless otherwise clearly and specifically defined.

[0070] In the present disclosure, unless otherwise explicitly specified and defined, terms such as "mount", "connect", "link", and "fix" shall be understood in a broad sense. For example, they can refer to a fixed connection, a detachable connection, or integration connection; they can be mechanical connections or electrical connections; they can be direct connections or indirect connections through an intermediate medium; they can be the internal communication between two components or the interaction relationship between two components, unless otherwise explicitly defined. For those of ordinary skill in the art, the specific meanings of the above terms in the present disclosure can be understood according to specific circumstances.

[0071] In the present disclosure, unless otherwise explicitly specified and defined, the first feature being "on" or "under" the second feature may mean that the first and second features are in direct contact, or the first and second features are in indirect contact through an intermediate medium. Moreover, the first feature being "above", "over" and "on top of" the second feature may mean that the first feature is directly above or obliquely above the second feature, or simply that the horizontal height of the first feature is higher than that of the second feature. The first feature being "below", "under" and "beneath" the second feature may mean that the first

feature is directly below or obliquely below the second feature, or simply that the horizontal height of the first feature is lower than that of the second feature.

[0072] In the description of this specification, references to terms such as "one embodiment", "some embodiments", "example", "specific example", or "some examples" are intended to mean that a specific feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present invention. In this specification, the schematic representations of the above terms are not necessarily directed to the same embodiment or example. Furthermore, the described specific features, structures, materials, or characteristics may be combined in any suitable manner in any one or more embodiments or examples. In addition, those skilled in the art may combine and integrate different embodiments or examples and the features of different embodiments or examples described in this specification without contradicting each other.

[0073] Although the embodiments of the present invention have been shown and described above, it should be understood that the above embodiments are illustrative and should not be construed as limiting the present invention. Those of ordinary skill in the art may make changes, modifications, substitutions, and variations to the above embodiments within the scope of the present invention.

Claims

1. A serrated electroplated diamond abrasive tool, comprising: an abrasive tool body (1) and a holding member (2), wherein the abrasive tool body (1) is mounted on the holding member (2), the abrasive tool body (1) is composed of at least one serrated substrate (11), the serrated surface of the substrate (11) comprises an inclined surface (12), a diamond layer (13) is plated on the inclined surface (12), the diamond layer (13) is arranged in a single layer in the normal direction of the inclined surface (12), the area on the inclined surface (12) where diamond particles are to be plated is provided with an electroplated layer (121), the diamond particles in the diamond layer (13) are encased and plated in the electroplated layer (121), and the thickness of the electroplated layer (121) in the normal direction of the inclined surface (12) is greater than the particle size of the diamond particles;
when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), a groove is formed between two adjacent serrations on the substrate (11), and a plurality of the grooves on each layer of the substrate (11) are combined and communicated with a plurality of the grooves on an adjacent layer of the substrate (11) to form a tooth plate water channel (14).
2. The serrated electroplated diamond abrasive tool according to claim 1, wherein on the inclined surface (12) of a single serration of the substrate (11), the difference in the wear direction of the abrasive tool during operation between any two points spaced by one time the particle size of the diamond particles in the rotation direction is greater than or equal to one quarter of the particle size of the diamond particles and less than or equal to one half of the particle size of the diamond particles.
3. The serrated electroplated diamond abrasive tool according to claim 1, wherein when the abrasive tool body (1) is a single substrate (11), the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows in the axial direction of the inclined surface (12), and the axial arrangement width of each row of the diamond particles in the axial direction of the inclined surface (12) is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.
4. The serrated electroplated diamond abrasive tool according to claim 1, wherein when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows on the inclined surface (12) in the stacking direction of the plurality of substrates (11), each row of the diamond particles is parallel to the rotation or movement trajectory of the diamond particles, and the arrangement width of each row of the diamond particles in the stacking direction of the plurality of substrates (11) is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.
5. The serrated electroplated diamond abrasive tool according to claim 3 or 4, wherein when the diamond particles are arranged in multiple rows or staggered multiple rows on the inclined surface (12), an area between two adjacent rows of the diamond particles where no diamond particles are plated is a blank plated layer (122), and the width of the blank plated layer (122) is greater than zero and less than two times the particle size of the diamond particles.
6. The serrated electroplated diamond abrasive tool according to claim 1, wherein the abrasive tool body (1) is mounted on the outer circumferential surface or the end face of the holding member (2); when the abrasive tool body (1) is mounted on the outer circumferential surface of the holding member (2), the substrate (11) is an annular structure with the inclined surface (12) arranged on its outer circumferential surface; when the abrasive tool body (1) is

mounted on the end face of the holding member (2), the substrate (11) is a sheet-like structure or an annular structure with the inclined surface (12) arranged on its top end.

7. The serrated electroplated diamond abrasive tool according to claim 6, wherein when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), the abrasive tool body (1) is mounted on the outer circumferential surface of the holding member (2), and the inclined surface (12) is arranged on the outer circumferential surface of the substrate (11), the plurality of substrates (11) are stacked up and down to form the abrasive tool body (1).
8. The serrated electroplated diamond abrasive tool according to claim 7, wherein the holding member (2) comprises a central column (21), a plurality of clamping blocks (22) and two cover plates (23), wherein the plurality of clamping blocks (22) are arranged around the periphery of the central column (21), the two cover plates (23) are respectively arranged at the top end and the bottom end of the central column (21) and the clamping blocks (22), the abrasive tool body (1) is arranged between the two cover plates (23), a plurality of anti-rotation clamping grooves (16) are arranged on the inner side of the substrate (11), the anti-rotation clamping grooves (16) are arc-shaped groove structures, the plurality of anti-rotation clamping grooves (16) are clamped with the ends of the plurality of clamping blocks (22) far away from the central column (21) in one-to-one correspondence, a spiral water channel (15) is formed between the anti-rotation clamping grooves (16) and the clamping blocks (22), and the spiral water channel (15) comprises a plurality of arc-shaped groove structures arranged in parallel up and down.
9. The serrated electroplated diamond abrasive tool according to claim 6, wherein when the abrasive tool body (1) is mounted on the end face of the holding member (2) and the substrate (11) is a sheet-like structure with the inclined surface (12) arranged on its top end, a plurality of the substrates (11) are stacked to form an abrasive tool unit, and a plurality of the abrasive tool units are arranged circumferentially on the end face of the holding member (2) to form the abrasive tool body (1).
10. The serrated electroplated diamond abrasive tool according to claim 6, wherein when the abrasive tool body (1) is mounted on the end face of the holding member (2) and the substrate (11) is an annular structure with the inclined surface (12) arranged on its top end, a plurality of the substrates (11) are stacked inside and outside to form the abrasive tool

body (1).

Amended claims under Art. 19.1 PCT

1. Basic information

International application No.:
PCT/CN2024/112628
Title of the invention: A SERRATED ELECTRO-
PLATED DIAMOND ABRASIVE TOOL
Docket No.: PIB24083250
Filing date: August 16, 2024
Name of the first applicant: GUILIN GRIND-
ACADEMY MATERIAL TECHNOLOGY CO.,
LTD.

2. Article 19 of the Treaty-Statement

The applicant of the present application has received the search report and written comments from the International Searching Authority, and the applicant has amended the claims under Article 19(1) of the Treaty.

3. Article 19 of the Treaty-Description

The applicant has amended the claims under Article 19(1) of the Treaty. The amendments are as follows: First, the original claim 3 is incorporated into claim 1 to form a new claim 1. Second, the serial numbers and citation relationships of other claims are adaptively amended. The above amendments are made based on the original description and claims, and the amended claims comply with the provision of Article 19 of the PCT.

4. List of appendixes

1. Statement under Article 19(1) of the Treaty
2. Article 19-Claims
3. Article 19-Amendment contrast sheets

5. Applicant, agency or common representative's signature /KEYCOM PARTNERS, P.C./

1. A serrated electroplated diamond abrasive tool, comprising: an abrasive tool body (1) and a holding member (2), wherein the abrasive tool body (1) is mounted on the holding member (2), the abrasive tool body (1) is composed of at least one serrated substrate (11), the serrated surface of the substrate (11) comprises an inclined surface (12), a diamond layer (13) is plated on the inclined surface (12), the diamond layer (13) is arranged in a single layer in the normal direction of the inclined surface (12), the area on the inclined surface (12) where diamond particles are to be plated is provided with an electroplated layer (121), the diamond particles in the diamond layer (13) are encased and plated in the

electroplated layer (121), and the thickness of the electroplated layer (121) in the normal direction of the inclined surface (12) is greater than the particle size of the diamond particles;

when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), a groove is formed between two adjacent serrations on the substrate (11), and a plurality of the grooves on each layer of the substrate (11) are combined and communicated with a plurality of the grooves on an adjacent layer of the substrate (11) to form a tooth plate water channel (14);

when the abrasive tool body (1) is a single substrate (11), the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows in the axial direction of the inclined surface (12), and the axial arrangement width of each row of the diamond particles in the axial direction of the inclined surface (12) is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.

2. The serrated electroplated diamond abrasive tool according to claim 1, wherein on the inclined surface (12) of a single serration of the substrate (11), the difference in the wear direction of the abrasive tool during operation between any two points spaced by one time the particle size of the diamond particles in the rotation direction is greater than or equal to one quarter of the particle size of the diamond particles and less than or equal to one half of the particle size of the diamond particles.

3. The serrated electroplated diamond abrasive tool according to claim 1, wherein when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), the diamond particles are arranged in a single row, multiple rows, a staggered single row, or staggered multiple rows on the inclined surface (12) in the stacking direction of the plurality of substrates (11), each row of the diamond particles is parallel to the rotation or movement trajectory of the diamond particles, and the arrangement width of each row of the diamond particles in the stacking direction of the plurality of substrates (11) is greater than one time the particle size of the diamond particles and less than two times the particle size of the diamond particles.

4. The serrated electroplated diamond abrasive tool according to claim 1 or 3, wherein when the diamond particles are arranged in multiple rows or staggered multiple rows on the inclined sur-

face (12), an area between two adjacent rows of the diamond particles where no diamond particles are plated is a blank plated layer (122), and the width of the blank plated layer (122) is greater than zero and less than two times the particle size of the diamond particles.

5. The serrated electroplated diamond abrasive tool according to claim 1, wherein the abrasive tool body (1) is mounted on the outer circumferential surface or the end face of the holding member (2); when the abrasive tool body (1) is mounted on the outer circumferential surface of the holding member (2), the substrate (11) is an annular structure with the inclined surface (12) arranged on its outer circumferential surface; when the abrasive tool body (1) is mounted on the end face of the holding member (2), the substrate (11) is a sheet-like structure or an annular structure with the inclined surface (12) arranged on its top end.

6. The serrated electroplated diamond abrasive tool according to claim 5, wherein when the abrasive tool body (1) is formed by stacking a plurality of the substrates (11), the abrasive tool body (1) is mounted on the outer circumferential surface of the holding member (2), and the inclined surface (12) is arranged on the outer circumferential surface of the substrate (11), the plurality of substrates (11) are stacked up and down to form the abrasive tool body (1).

7. The serrated electroplated diamond abrasive tool according to claim 6, wherein the holding member (2) comprises a central column (21), a plurality of clamping blocks (22) and two cover plates (23), wherein the plurality of clamping blocks (22) are arranged around the periphery of the central column (21), the two cover plates (23) are respectively arranged at the top end and the bottom end of the central column (21) and the clamping blocks (22), the abrasive tool body (1) is arranged between the two cover plates (23), a plurality of anti-rotation clamping grooves (16) are arranged on the inner side of the substrate (11), the anti-rotation clamping grooves (16) are arc-shaped groove structures, the plurality of anti-rotation clamping grooves (16) are clamped with the ends of the plurality of clamping blocks (22) far away from the central column (21) in one-to-one correspondence, a spiral water channel (15) is formed between the anti-rotation clamping grooves (16) and the clamping blocks (22), and the spiral water channel (15) comprises a plurality of arc-shaped groove structures arranged in parallel up and down.

8. The serrated electroplated diamond abrasive tool according to claim 5, wherein when the abrasive tool body (1) is mounted on the end

face of the holding member (2) and the substrate (11) is a sheet-like structure with the inclined surface (12) arranged on its top end, a plurality of the substrates (11) are stacked to form an abrasive tool unit, and a plurality of the abrasive tool units are arranged circumferentially on the end face of the holding member (2) to form the abrasive tool body (1). 5

9. The serrated electroplated diamond abrasive tool according to claim 5, wherein when the abrasive tool body (1) is mounted on the end face of the holding member (2) and the substrate (11) is an annular structure with the inclined surface (12) arranged on its top end, a plurality of the substrates (11) are stacked inside and outside to form the abrasive tool body (1). 10 15

Statement under Art. 19.1 PCT

[0001] Statement or description of the amendments under Article 19 of the Treaty Dear Examiner: 20

Thanks for your valuable comments on PCT International Application No. PCT/CN2024/112628. Under the provision of Article 19 of the PCT, the applicant has an opportunity to amend the claims upon receipt of the International Search Report and the written comments from the International Searching Authority within 2 months from the date of issuing the International Search Report. The applicant may amend the originally submitted claims in response to the International Search Report. 25 30

Description of the amendments

[0002] The following amendments are made under Article 19 of the Treaty:

The original claim 3 is incorporated into claim 1 to form a new claim 1; and 35

The serial numbers and citation relationships of other claims are adaptively amended.

[0003] The above amendments are made based on the original description and claims, and the amended claims comply with the provision of Article 19 of the PCT. 40

[0004] We sincerely thank your hard word in this case. Thank you! 45

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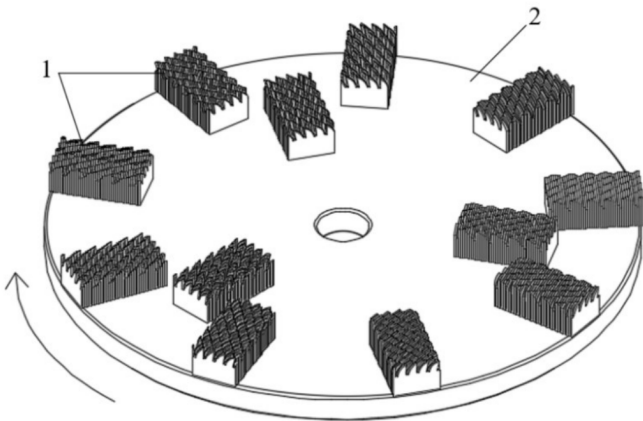


FIG. 1

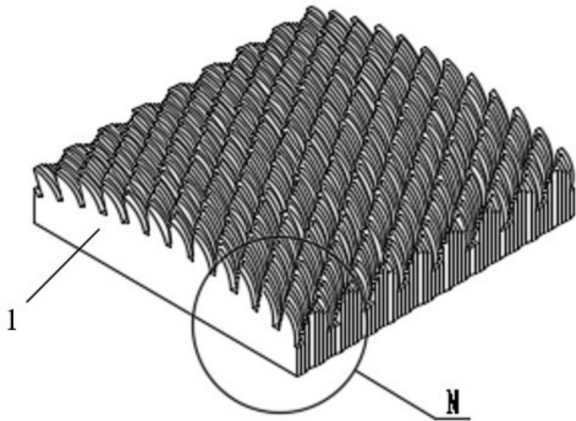


FIG. 2

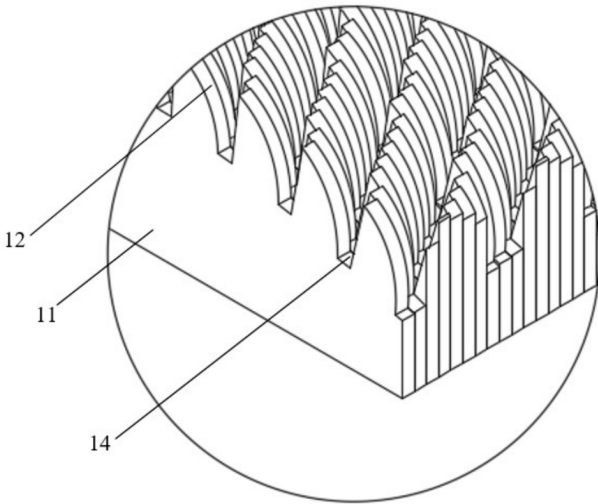


FIG. 3

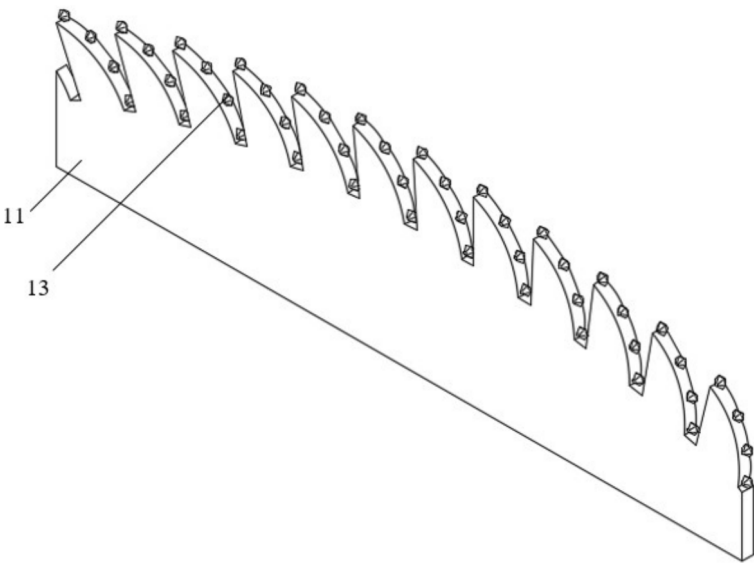


FIG. 4

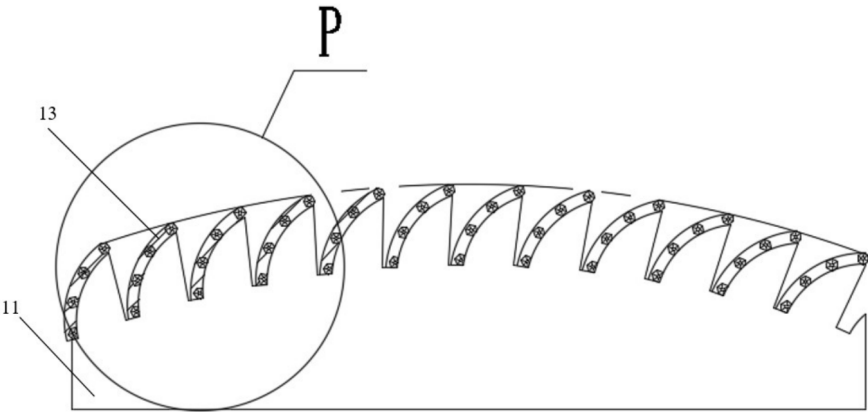


FIG. 5

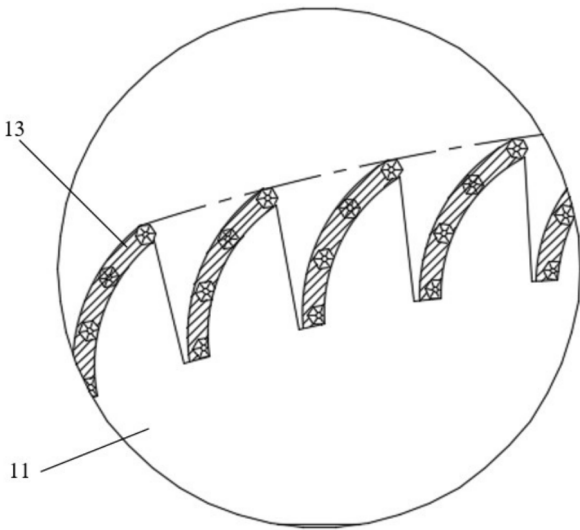


FIG. 6

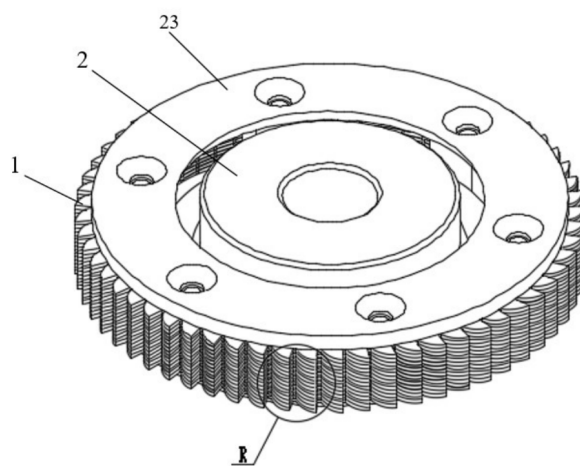


FIG. 7

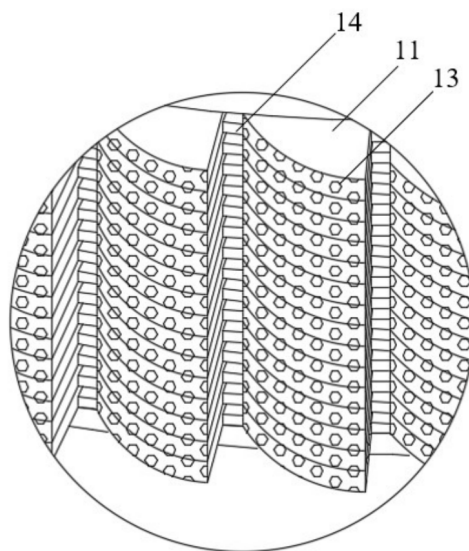


FIG. 8

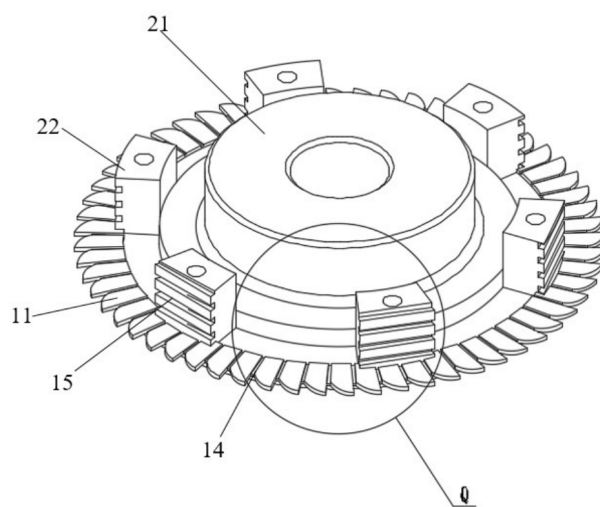


FIG. 9

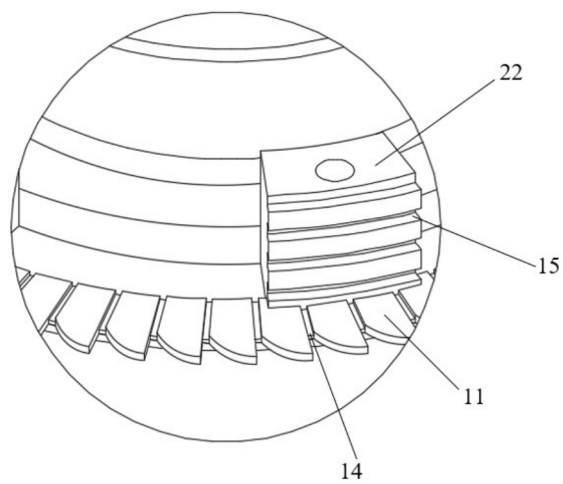


FIG. 10

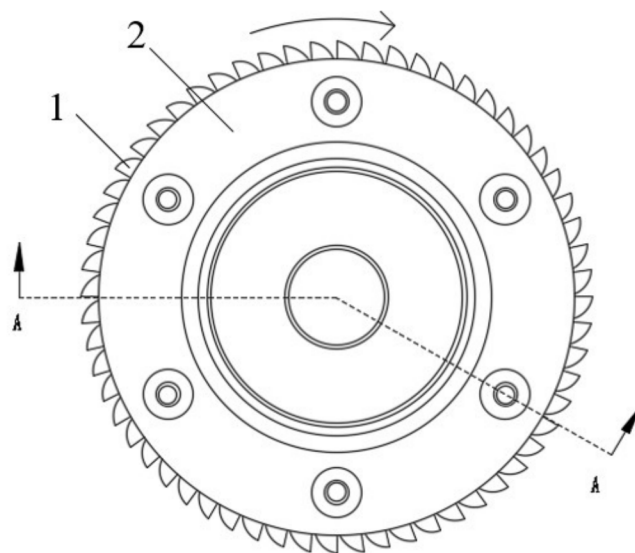


FIG. 11

A-A

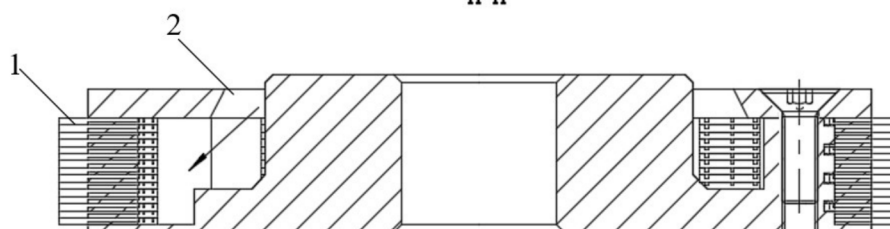


FIG. 12

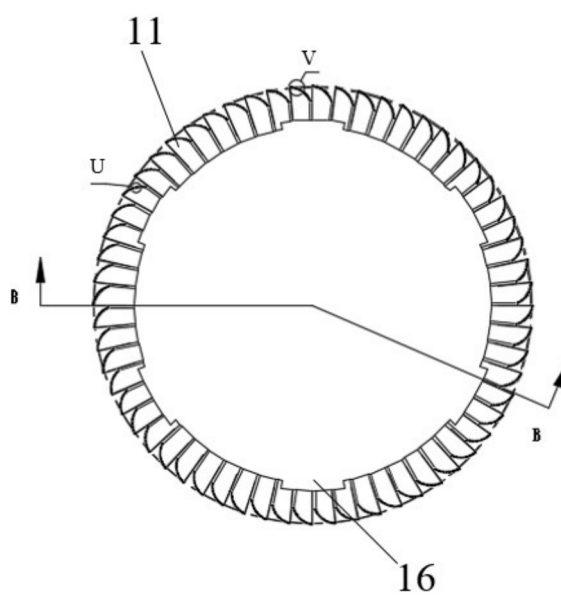


FIG. 13

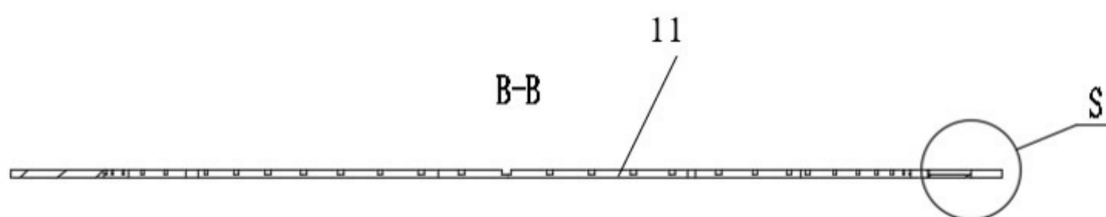


FIG. 14

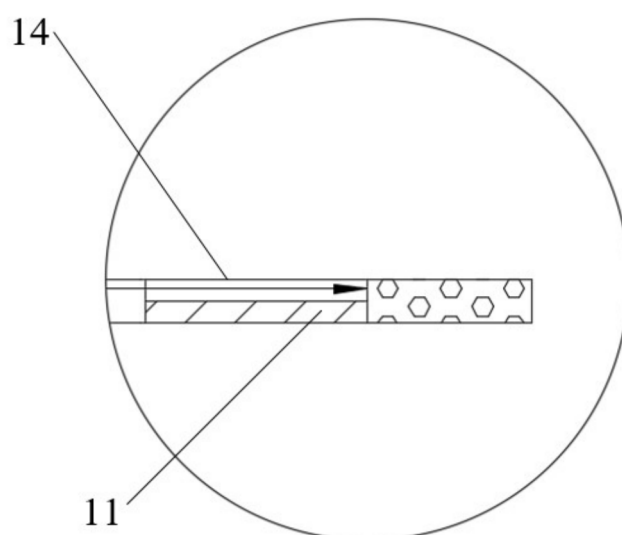


FIG. 15

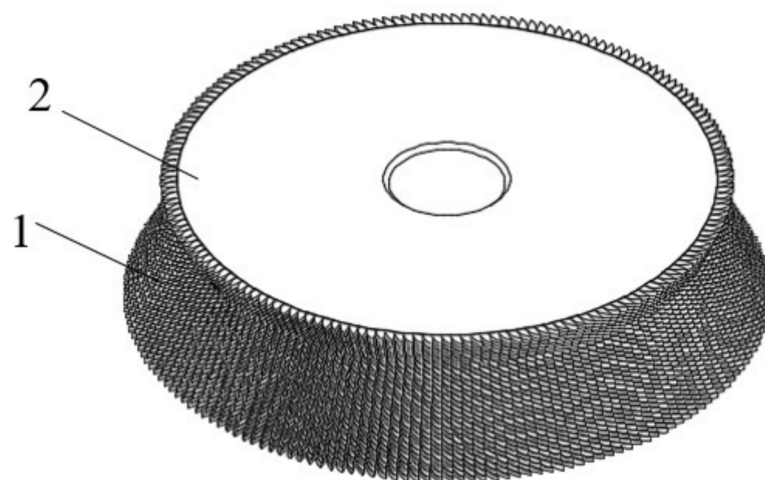


FIG. 16

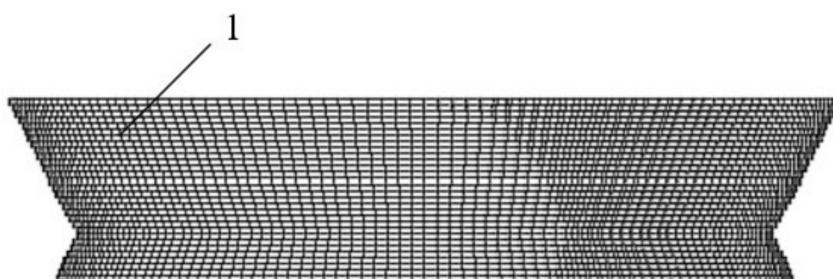


FIG. 17

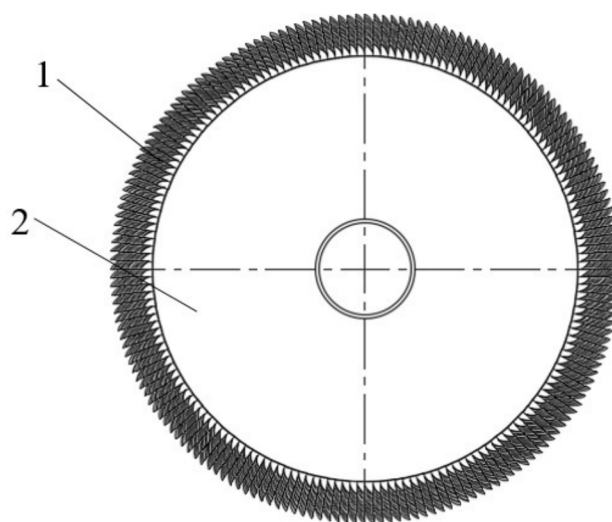


FIG. 18

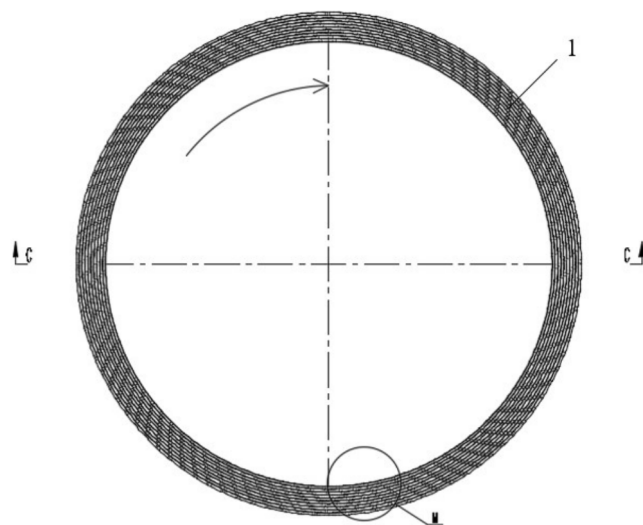


FIG. 19

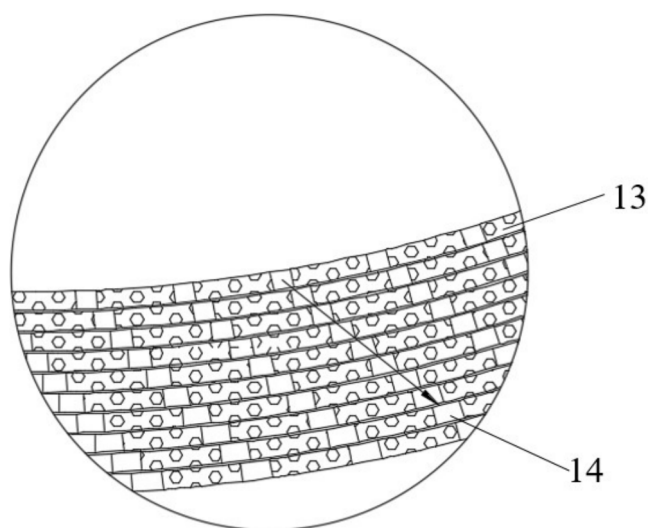


FIG. 20

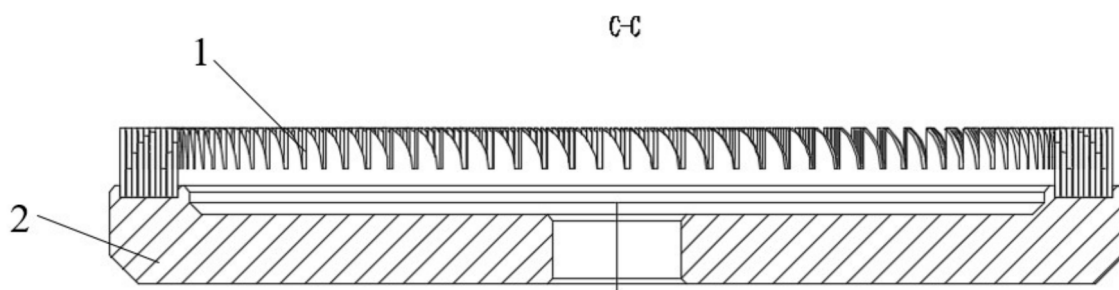


FIG. 21

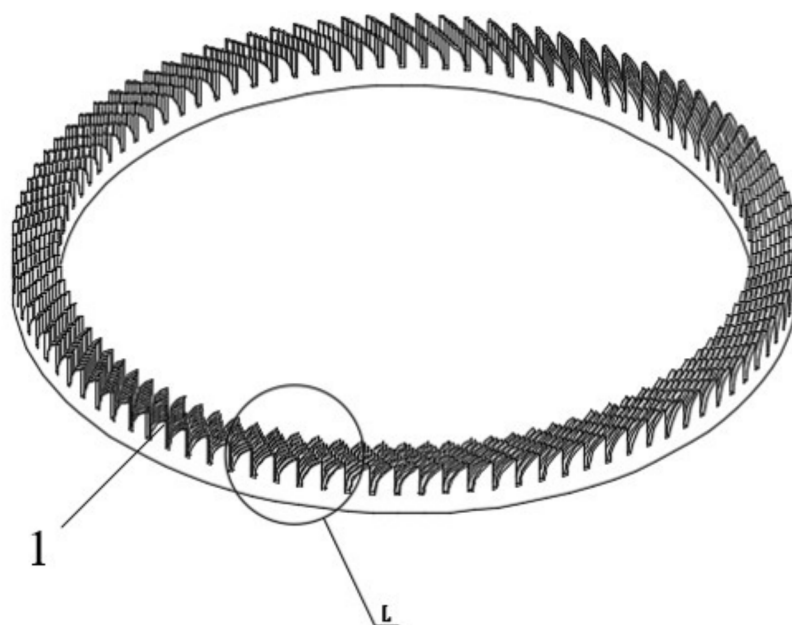


FIG. 22

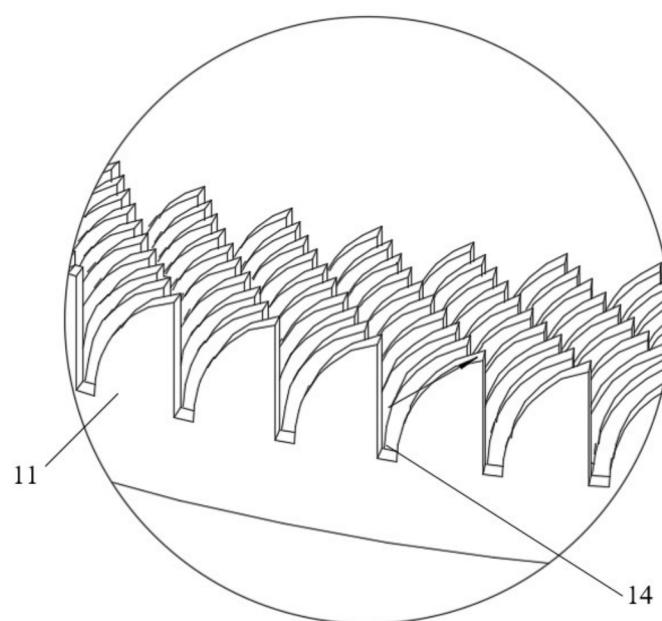


FIG. 23

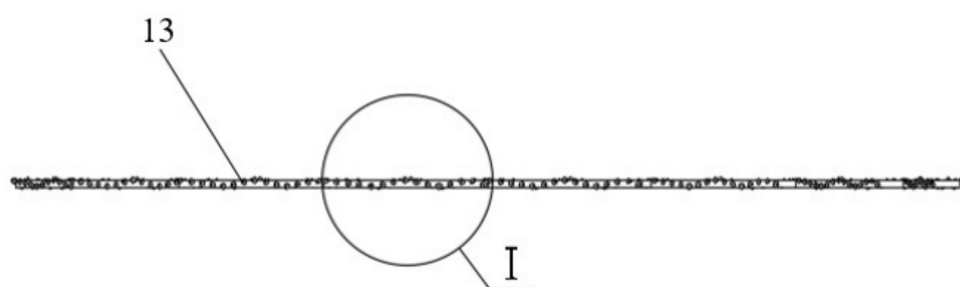


FIG. 24

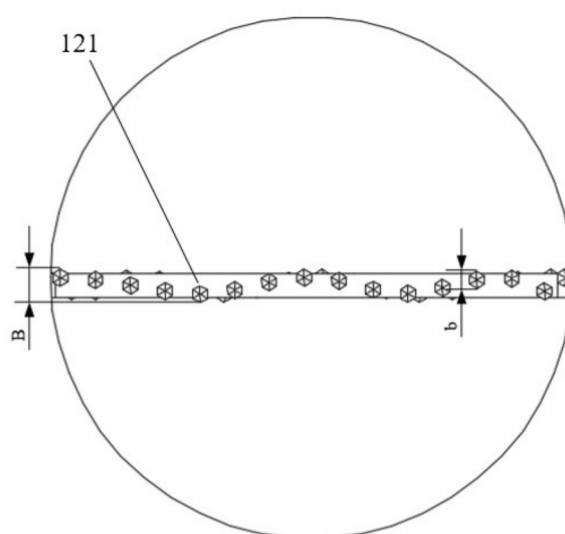


FIG. 25

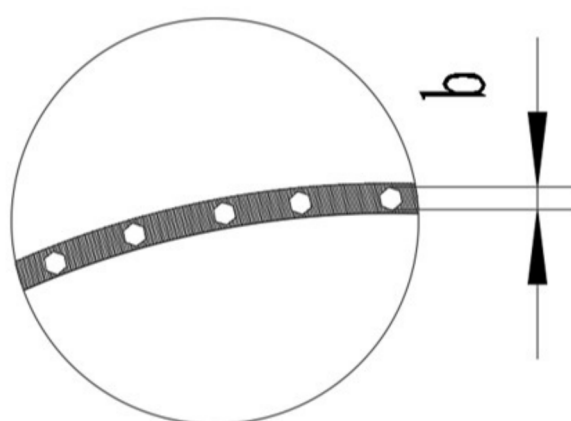


FIG. 26

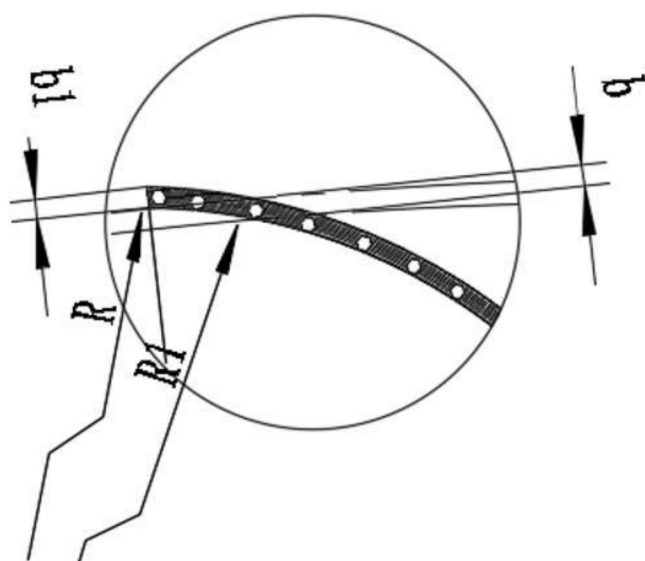


FIG. 27

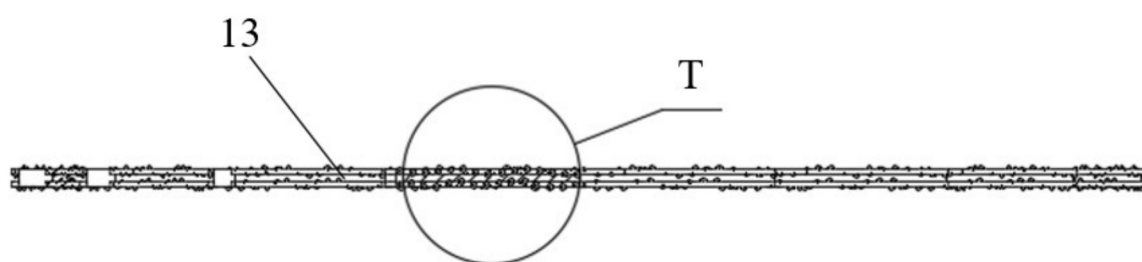


FIG. 28

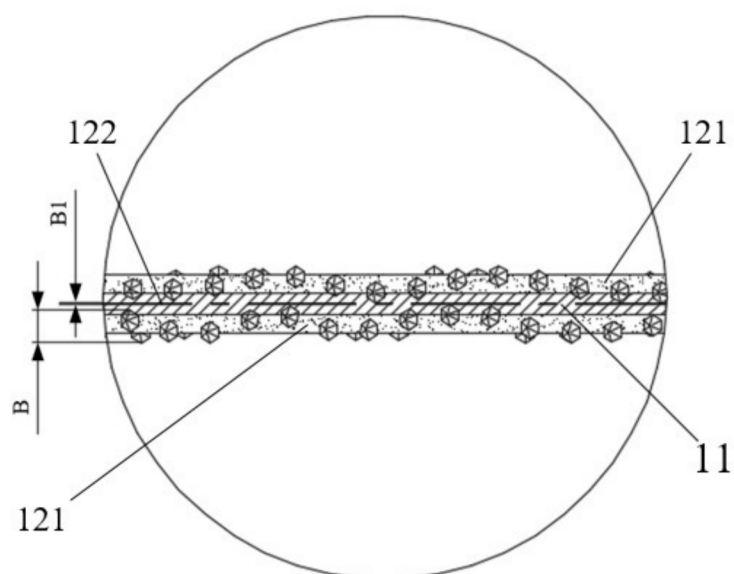


FIG. 29

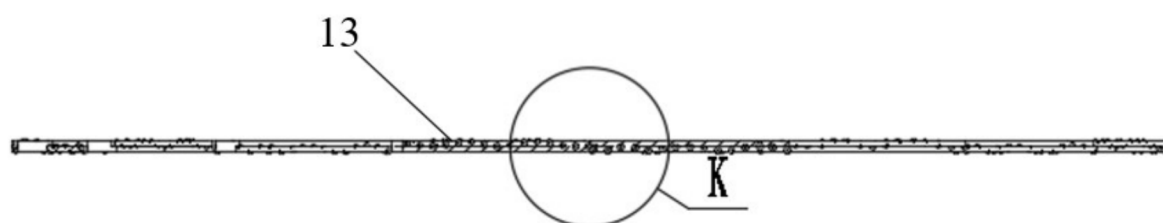


FIG. 30

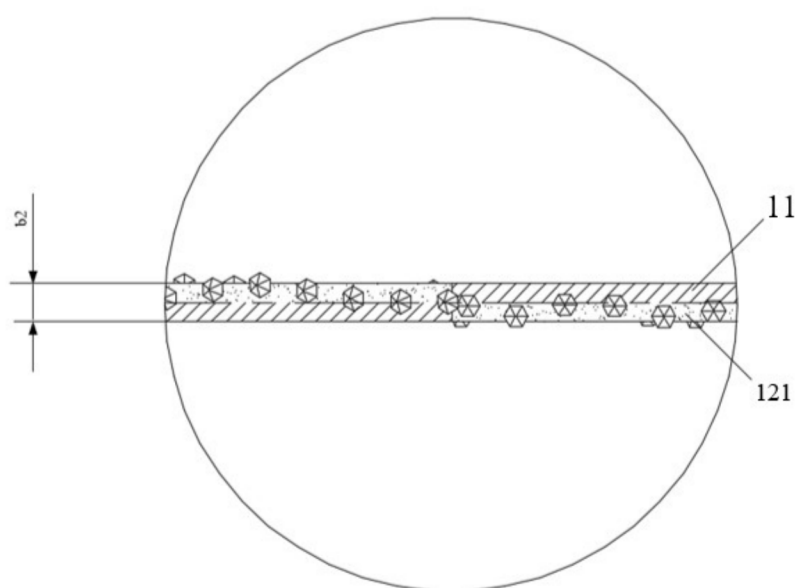


FIG. 31

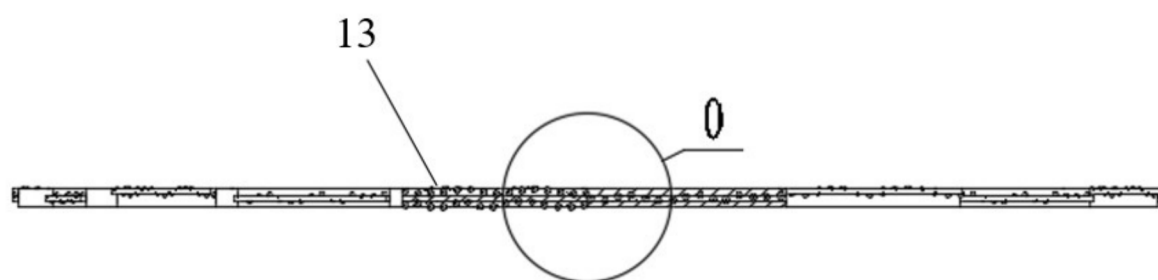


FIG. 32

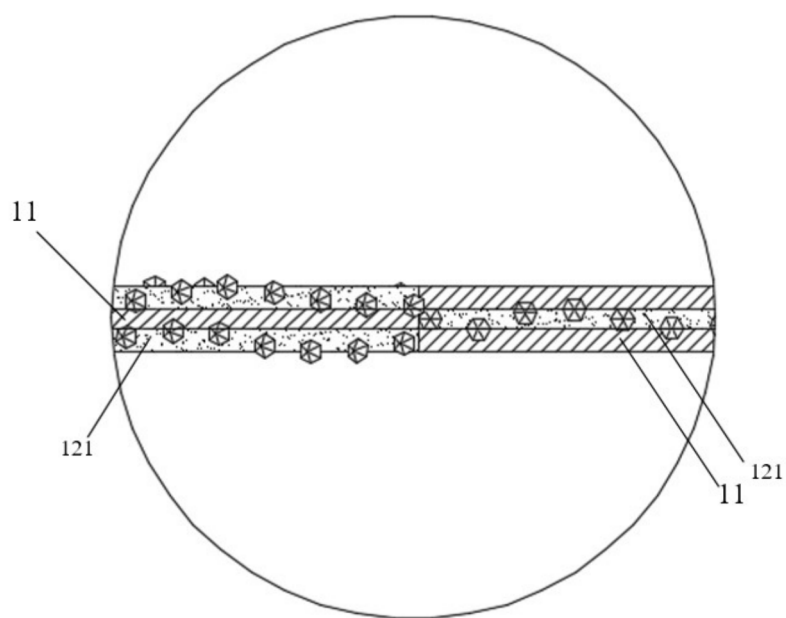


FIG. 33

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/112628

A. CLASSIFICATION OF SUBJECT MATTER

B28D 5/02(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)

IPC: B28D, B24D, B23D

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)

CNTXT, ENTXTC, DWPI: 桂林磨院, 桂林创源, 宋京新, 磨, 锯, 齿, 锯齿, 水, 冷却, 槽, 通道, 层, 片, 叠, 拼, 镀, 孕镶, 金刚石, grind+, mill+, saw+, gear+, tooth, teeth, diamond

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 117103140 A (GUILIN MOYUAN MATERIAL TECHNOLOGY CO., LTD. et al.) 24 November 2023 (2023-11-24) description, paragraphs 50-83, and figures 1-23	1-10
PX	CN 117103479 A (GUILIN MOYUAN MATERIAL TECHNOLOGY CO., LTD. et al.) 24 November 2023 (2023-11-24) description, paragraphs 44-83, and figures 1-14	1-10
PX	CN 220946091 U (GUILIN MOYUAN MATERIAL TECHNOLOGY CO., LTD. et al.) 14 May 2024 (2024-05-14) description, paragraphs 36-67, and figures 1-14	1-10
Y	CN 114378958 A (SONG JINGXIN et al.) 22 April 2022 (2022-04-22) description, paragraphs 1-7 and 67-147, and figures 1-18	1-10
Y	CN 103586537 A (HEIXUANFENG SAW INDUSTRY CO., LTD.) 19 February 2014 (2014-02-19) description, paragraphs 27-28, and figures 1-5	1-10

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 01 November 2024	Date of mailing of the international search report 11 November 2024
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088	Authorized officer Telephone No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 102225536 A (FUJIAN WANLONG DIAMOND TOOLS CO., LTD.) 26 October 2011 (2011-10-26) entire document	1-10
A	CN 109822464 A (QUANZHOU ZHONGZHI DIAMOND TOOLS CO., LTD.) 31 May 2019 (2019-05-31) entire document	1-10
A	CN 112536734 A (SONG JINGXIN et al.) 23 March 2021 (2021-03-23) entire document	1-10
A	CN 215433267 U (YUZHOU QIFANG SUPERHARD MATERIAL PRODUCTS CO., LTD.) 07 January 2022 (2022-01-07) entire document	1-10
A	JP 2004322230 A (READ CO., LTD.) 18 November 2004 (2004-11-18) entire document	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2024/112628

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CN	117103140	A	24 November 2023	None			
CN	117103479	A	24 November 2023	None			
CN	220946091	U	14 May 2024	None			
CN	114378958	A	22 April 2022	CN	218398874	U	31 January 2023
CN	103586537	A	19 February 2014	None			
CN	102225536	A	26 October 2011	None			
CN	109822464	A	31 May 2019	None			
CN	112536734	A	23 March 2021	CN	214135618	U	07 September 2021
CN	215433267	U	07 January 2022	None			
JP	2004322230	A	18 November 2004	None			