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(54) **HIGHLY EFFICIENT CUTTING AND GRINDING WHEEL DESIGNED TO RETAIN ITS SHAPE**

(57) Disclosed is a highly efficient cutting and grinding wheel designed to retain its shape, comprising a basic body (1) and a grinding ring (2), with water outlets (2-1) uniformly distributed on the grinding face of the grinding ring (2). Within the range of the length of the arc arbitrarily set on the grinding face, the number of the water outlets (2-1) is greater than zero, and the length of the arbitrarily set arc is 1-3 times the contact length between the grinding ring (2) and a workpiece being machined (8) when grinding. The grinding face is a heteromorphic grinding face and the outside of the water outlets (2-1) is an entity machining area of the heteromorphic grinding face that is involved in grinding. The overall line length of the circumference of the entity machining area in different axial positions corresponds to the machining allowance of the workpiece being machined (8) at the same positions and the correlation therebetween is directly proportional or nearly directly proportional. Water channels in communication with the water outlets (2-1) are made inside the basic body (1), cooling water being injected from a water inlet (3) of the basic body (1) and passing through the water channel for acting in the grinding contact region to create complete cooling of the face. During operation of the present invention, deformation of the grinding face is small, the face can be quickly cooled, and chip removal is fast. The present invention is applicable to fast and high speed machining, and the machining quality of the surface of the workpiece is improved, sharpness of the grinding wheel is maintained and the service life is pro-

longed.

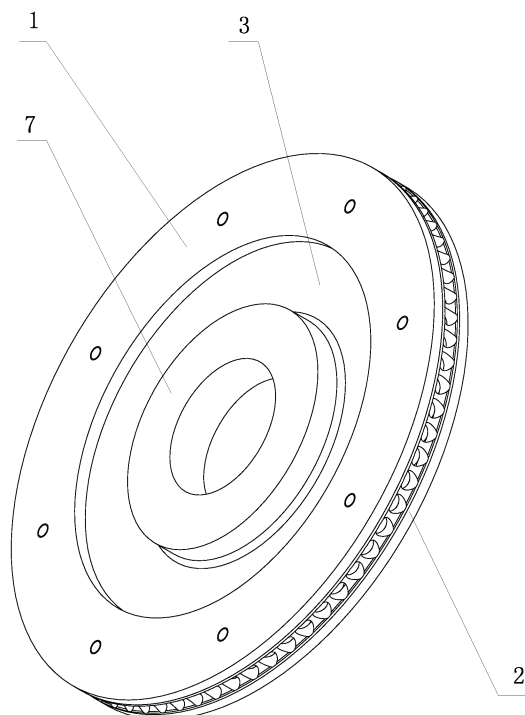


FIG. 1

Description

[0001] The invention relates to a grinding tool, and more particularly to an anti-deforming and highly efficient grinding wheel.

[0002] Grinding of metals or non-metal materials is finished by a grinding wheel. A grinding wheel having a planar grinding face (or a planar moving track) is used for plane processing and a forming wheel having non-planar (special-shaped) grinding face is used for special-shaped edge grinding.

[0003] Two important indicators, i.e., the grinding efficiency and the deformation of the grinding face, are used to assess the performance of the grinding wheel.

1. Grinding efficiency

[0004] A large amount of grinding heat and chips are produced in the grinding process of the grinding wheel, so that the grinding wheel needs to be cooled during the processing (planar grinding and special-shaped grinding). The cooling method includes providing cooling water by a cooling mechanism of a grinding machine and enabling the cooling water to act on the grinding face. The cooling water is capable of cooling the processing face of the workpiece as well as removing a majority of the chips by washing. The discharge rate and the discharge amount of the chips directly affect the quality and efficiency of the processing.

[0005] The grinding machine is divided into an outer cooling grinding machine and an inner cooling grinding machine according to the difference in cooling modes.

1) The cooling mechanism of the outer cooling grinding machine has a simple structure and mainly includes a cooling pipe connected to a pumping source. The cooling pipe is installed on a working table. A coolant ejected from the cooling pipe directly acts on the processing face of the workpiece, however, the coolant is fast separated from the processing face of the workpiece under the action of the centrifugal force due to the rotation of the grinding wheel. Furthermore, the working face is tightly attached to the workpiece during the grinding, and the chips produced in the grinding form a proof layer against the coolant, so that the coolant is actually difficult to enter the working face during processing but only functions in cooling the grinding wheel before and after the grinding.

2) The inner cooling grinding machine is provided with the grinding wheel having the inner cooling mechanism. The coolant is capable of directly acting on the working face of the grinding. Generally, the cooling effect on the inner cooling mode is better than that of the outer cooling mode. The inner cooling grinding wheel is provided with a water inlet disposed on an axle hole of a center axle of a base correspond-

ing to the position of a water outlet of a rotating shaft of the grinding wheel on the inner cooling grinding machine. The grinding wheel is provided with (a small number of) water channels disposed inside the base and (a small number of) water outlets on the grinding ring. The coolant is supplied by the water outlet of the rotating shaft for mounting the grinding wheel. The coolant enters the water inlet of the axle hole of the center axle of the grinding wheel via the water outlet of the rotating shaft, passes through the water channels, and acts on the working face after being ejected out of the water outlets of the grinding ring.

Since problems including the inner cooling layout, the connection of the water outlet of the rotating shaft, the water inlet of the axle hole of the center axle, and the outlets of the grinding wheel, and the sealing of the connection are to be solved, the complicated structure of the inner cooling grinding machine is resulted, and the production costs of the inner cooling grinding machine is increased. Furthermore, only the special grinding wheel having the cooling structure rather than the common grinding wheel is applicable to the inner cooling grinding machine, thereby resulting in the increase of the comprehensive processing costs.

3) In both the common grinding wheel used in the outer cooling grinding machine and the inner cooling grinding wheel used in the inner cooling grinding machine, the grinding faces in the grinding wheel base on the current technology determines that the discharge thread of the chips is long and the discharge amount of the chips is limited. However, the discharge rate and the discharge amount of the chips directly affect the processing quality and efficiency. When it is difficult to totally removing the chips, the processing quality and efficiency are decreased. This is the key factor limiting the working efficiency of the grinding wheel.

2. Deformation of the grinding face

[0006] The non-planar shape (special shape) of the grinding face is corresponding to the formation requirement of the material to be processed. The final forming shape of the workpiece is generally an arc or other geometric shaped, such as regular geometric shape, or irregular geometric shape formed by straight lines, arc lines, or curved lines.

[0007] For blanks to be special-shaped edge grinded, a machining allowance is reserved. The reserved machining allowance is not particularly corresponding to the shape of the special-shaped grinding face but in most conditions the original geometric shape of the machining allowance is relatively regular (commonly a square shape) and the material is uniform. During the processing, processing capacities at different positions in the ax-

ial direction of the special-shaped grinding face of the grinding wheel are probably not equivalent, or even in the relation of multiple differences, however, the material of the grinding wheel is uniform. Thus, different wear degrees are resulted along with corresponding processing capacities of different axial positions of the special-shaped grinding face of the grinding wheel, deformation of the special-shaped grinding face, followed by abnormal use of the grinding wheel, easily occurs, thereby requiring rehabilitation or resulting in abandonment.

[0008] In view of the above-described problems, it is one objective of the invention to provide an anti-deforming and highly efficient grinding wheel that has enhanced anti-deforming capacity, improved effects in cooling and chip removal. It is another objective of the invention to reach inner cooling in an outer grinding machine.

[0009] An anti-deforming and highly efficient grinding wheel comprises a base and a grinding ring disposed on the base. The grinding ring comprises a grinding face comprising water outlets passing through the grinding ring. The water outlets each communicates with a corresponding water channel disposed inside the base, and the water channels are connected to a water inlet. A number of the water outlets in an arc length on the grinding face is more than zero. The arc length is between one and three times a contact line length between the grinding ring and a workpiece during grinding. The grinding face is a special-shaped grinding face. The water outlets are a non-entity processing region for washing, and a remaining part of the special-shaped grinding face is an entity processing region for grinding. Total circumference lengths at different axial positions of the entity processing region are proportional to or approximately proportional to machining allowances at corresponding positions of the workpiece, respectively.

[0010] The water outlets (the non-entity processing region) are capable of cooling the grinding wheel and the workpiece as well as simultaneously introducing chips produced in the grinding into the water outlets for storage. When the outlets stored with chips separates from a working face of the grinding along with the rotation of the grinding wheel, the chips therein are smoothly discharged under the action of the centrifugal force and the water flow (cooling water is capable of entering the water inlet of the base and being ejected from the water outlets via the corresponding water channels), thereby effectively and timely removing the chips.

[0011] For high qualified grinding wheel, to process workpiece that has high requirements on the machining precision and flatness, the number of the water outlets is preferably larger than zero in the range of between one and three times the contact line length of the grinding, that is, at least a small part or even a very small part of one water outlet is within the range of the contact line length of the grinding. Thus, it is ensured that in every moment of the processing process, the cooling water always acts on the grinding face for timely cooling within the range of the contact line length between the grinding

wheel and the workpiece, thereby realizing the true sense of cooling in the whole process and avoiding abnormal wear resulted from local excessive high temperature. Furthermore, the water outlets are capable of timely introducing the chips produced in the grinding into the water outlets for storage and timely and effectively discharging the chips, so that the grinding capability of the abrasive grains of the grinding wheel is ensured.

[0012] In the entity processing region (referring to portions contacting with the workpiece during the grinding) of the grinding ring, different axial positions of the grinding wheel are allocated with corresponding total circumference lengths of the entity processing region according to the machining allowances that need to be finished by the grinding wheel during the processing. In another word, the larger the machining allowance of a certain portion of the workpiece is, the larger the corresponding total circumference length of the entity processing region is; and the smaller the machining allowance of a certain portion of the workpiece is, the smaller the corresponding total circumference length of the entity processing region is. Thus, the machining allowance is proportional to corresponding total circumference length of the entity processing region, thereby forming an equivalent shaped abrasion structure and solving or alleviating the deformation problem of special-shaped grinding wheel.

[0013] When requirement on the shape of the workpiece is not high, the range thereof is relatively wide, or the manufacturing of the grinding wheel is excessively difficult, different positions in the axial direction of the grinding wheel are allocated with corresponding total circumference lengths of the entity processing region according to the machining allowances that need to be finished by the grinding wheel during the processing process. The proportional relation between the two is properly widened to be approximate proportional relation.

[0014] The more the water outlets are employed, the better the cooling effect and the chip removal effect are. However, the number of the water outlets is determined according to different conditions and in comprehensive consideration of factors, such as the production costs.

[0015] In conditions that the grinding range (the contact line length) is small and the water outlets are large and sparsely arranged, whether a large part or a small part or even a very small part of one water outlet is within one fold of the range of the contact line length, very good effect can be obtained. In conditions that the water outlets are small and intensive, the number of the water outlet within one fold of the range of the contact line during the grinding is preferably one or more than one, such as several, tens, or dozens of the water outlets. According to working experiences and experiments, the number of the water outlets is preferably no more than 30. Excessive water outlets increase the difficulty in manufacturing and decrease the intensity of the grinding ring.

[0016] For low qualified grinding wheel, if it is used to process workpiece that has not high requirements on the machining precision and the flatness, or if it is a low-

speed grinding wheel, the density of the water outlets can be slightly decreased. The requirement on the arrangement of the water outlets can be widened according to requirements of grinding wheels of different qualities. It has demonstrated from repeated experiments that more than zero water outlet distributed within three or more than three times the contact line length of the grinding reaches obviously better cooling and chip removal effects than that of products in the prior art. Similarly, the number of the water outlets is preferably no more than 30.

[0017] As the number of the water outlets is designed to be enough, the material for manufacturing the grinding ring is effectively reduced, and the production costs of the grinding wheel is decreased. Theoretically, the water outlets can be designed to be any shapes, such as regular geometric shapes, or irregular geometric shapes formed by straight lines, arcs, and curves. For curved processing face of the workpiece, the water outlets in circular or oval shape that are easily processing are adopted.

[0018] When an axial width of the water outlet is larger than a thickness of the processing face of the workpiece, a micro-distance discontinuous grinding structure or a semi-discontinuous grinding structure is formed. The semi-discontinuous grinding structure has much smaller beating, thereby being beneficial to process those having high requirement on the edge collapse.

[0019] When the axial width of the water outlet is smaller than the thickness of the processing face of the workpiece, the water outlets form a continuous grinding structure, edge collapse resulting from beating is eliminated, thereby satisfying machining condition that has high requirement on the edge collapse.

[0020] A plurality of arrangements of the water channels and the water inlets and connection modes therebetween can be employed to reach the inner cooling structure of the grinding wheel of the invention. For example, like the existing inner cooling grinding wheel, the water channels are connected to the water inlet disposed on the axle hole of the center axle of the base, the cooling water flows from a water outlet of a rotating shaft of the grinding wheel to the water inlet of the axle hole of the base, passes through the water channels and corresponding water outlets and is finally ejected on the working face of the grinding.

[0021] The preferable arrangement of each of the water channels and the water inlet and the connection mode therebetween is changing the position of the water inlet to reach the inner cooling function on an outer cooling grinding machine. One of the methods is arranging the water inlet on the base to make the water inlet be an open mouth, introducing a coolant ejected from a cooling pipe of the outer cooling grinding machine to the open mouth of the base, and enabling the coolant to pass through the water channels and the water outlets and to act on the working face of the grinding. Thus, the cooling in the whole processing process is ensured.

[0022] The structure of the base can be further im-

proved, thereby simplifying the processing of the water inlet and the water channels. As an improved structure, the base comprises two base plates. The grinding ring is clamped between the two base plates. A water storage region functioning as the water channel forms between the two base plates. The water inlet is disposed on one base plate, and the center axle is disposed on the other base plate.

[0023] The water inlet is a ring-shaped mouth disposed on the base plate.

[0024] The base plate provided with the ring-shaped mouth is a ring-shaped press plate. A diameter of an inner ring of the ring-shaped press plate is larger than the center axle. The ring-shaped mouth is produced between the inner ring of the ring-shaped press plate and the center axle.

[0025] In condition that two or more than two grinding wheels arranged co-axially in parallel are used, particularly for the grinding wheel used in the outer cooling grinding machine, the water channels of the grinding wheels communicate with one another for ensuring that the coolant is supplied to each grinding wheel.

[0026] The grinding ring of the grinding wheel is a superhard abrasive. The entity processing region of the grinding ring is formed by one-step formation or by combination formation.

[0027] The technical solution is also applicable for dry grinding, in which, the cooling water is substituted by the air, and thus, the water inlet, the water channels and the water outlets are correspondingly replaced by an air inlet, air channels, and air outlets.

[0028] Compared with the prior art, advantages of the invention are summarized as follows:

[0029] 1. The grinding wheel of the invention is provided with enough number of water outlets based on the structure of the inner cooling grinding wheel, so that the chips produced in the grinding region are quickly discharged, the surface roughness of the processing face and the sharpness of the grinding wheel are largely improved, thereby ensuring that the grinding wheel is capable of processing the workpiece much faster and improving the production efficiency.

[0030] 2. The grinding wheel of the invention comprises the equivalent shaped abrasion structure, so that the anti-deformation ability of the grinding wheel is enhanced in the structure, deformation factors and malfunction factors are largely decreased, and the service life of the grinding wheel is prolonged.

[0031] 3. The grinding wheel of the invention adopts continuous, discontinuous, or semi-discontinuous grinding modes according to the quality requirement, and combines the fast cooling mode of the inner cooling with the structure of fast chips discharge (accommodation) to largely improve the surface roughness of the processing face and the sharpness of the grinding wheel, thereby ensure fast processing of the grinding wheel.

[0032] 4. The grinding wheel of the invention enables a majority of the outer cooling special-shaped machining

devices on the market to realize the functions of the inner cooling machining devices by hardly increasing any production costs. Thus, money invested in highly priced inner cooling machining device is saved and the economic effect is very obvious.

FIG. 1 is a stereogram of a grinding wheel of the invention;

FIG. 2 is a front view of FIG. 1;

FIG. 3 is a structure diagram of an inner part of FIG. 2;

FIG. 4(a) is a diagram showing distribution of a non-entity processing region on a special-shaped grinding face of the grinding ring of FIGS. 1-3, in which, an axial width of the non-entity processing region is larger than a thickness of a processing piece;

FIG. 4(b) is a diagram showing distribution of a non-entity processing region on a special-shaped grinding face of the grinding ring of FIGS. 1-3, in which, an axial width of the non-entity processing region is smaller than a thickness of a processing piece;

FIG. 5 is a diagram showing a workpiece being machined by a grinding ring.

[0033] In the drawings, the following numbers are used: 1. Base; 1-1. Base plate; 1-2. Ring-shaped press plate; 2. Grinding ring; 2-1. Water outlet; 2-2. Entity processing region; 3. Water inlet; 4. Support column; 5. Water storage region; 6. Bolt; 7. Center axle; and 8. Workpiece.

[0034] For further illustrating the invention, experiments detailing an anti-deforming and highly efficient grinding wheel are described hereinbelow combined with the drawings.

[0035] An anti-deforming and highly efficient grinding wheel comprises a base 1 and a grinding ring 2. The base 1 is assembled by a base plate 1-1 and a ring-shaped press plate 1-2.

[0036] The base plate 1-1 is a circular plate, a center axle 7 is disposed at an axis position of the base plate 1-1, an axle hole of the center axle 7 and a rotating shaft of the grinding wheel of the grinding machine are assembled together. A diameter of an outer ring of the ring-shaped press plate 1-2 is equal to a diameter of a circle of the base plate 1-1, and a diameter of an inner ring of the ring-shaped press plate 1-2 is larger than an outer diameter of the center axle 7 of the base plate 1-1. The base plate 1-1 and the ring-shaped press plate 1-2 are separated by hollow support columns 4 uniformly distributed along the circumference of the base plate 1-1. Bolts 6 are inserted into the support columns 4 to axially fasten the base plate 1-1 and the ring-shaped press plate 1-2 together. Meanwhile, a grinding ring 2 is clamped and bonded (usually by a glue) between inner end faces at

circumferential edges of the base plate 1-1 and the ring-shaped press plate 1-2, as shown in FIGS. 1-3.

[0037] Taken processing of an arc edge as an example, a grinding face of the grinding ring 2 is in the shape of an arc and is provided with circular or oval water outlets 2-1 that pass through the grinding ring and are uniformly distributed on the grinding face. The water outlets 2-1 are a non-entity process region 2-1 of the arc-shaped grinding face, and remain portions of the arc-shaped grinding face is an entity processing region 2-2 that contacts with the workpiece 8. The number of the water outlets 2-1 is larger than zero and smaller than 30 within a range of a contact line length between the grinding ring 2 and the workpiece 8 during the grinding of the grinding wheel. Meanwhile, total circumference lengths at different axial positions of the entity processing region 2-2 are corresponding to machining allowances at corresponding positions of the workpiece 8, respectively, and the corresponding relation is a proportion relation. In another word, ratios of the total circumference lengths L_n at different axial positions of the entity processing region 2-2 and the machining allowances Δn at corresponding positions of the workpiece 8 are equivalent ($L_n/\Delta n$, $L_1/\Delta 1$, $L_2/\Delta 2$, $L_3/\Delta 3$,are equivalent), thereby forming an equivalent-shaped abrasion structure on the arc-shaped grinding face. That is, different axial positions of the grinding wheel are allocated with corresponding total circumference lengths of the entity processing region according to the machining allowances that need to be finished by the grinding wheel during the processing process. The larger the machining allowance of a certain portion of the workpiece is, the larger the corresponding total circumference length of the entity processing region is. The smaller the machining allowance of a certain portion of the workpiece is, the smaller the corresponding total circumference length of the entity processing region is. The machining allowance and the corresponding total circumference length at different positions form a proportional constant C , thereby forming the equivalent-shaped abrasion structure and solving or alleviating the deformation problem of special-shaped grinding wheel, as shown in FIGS. 1-2, 4(a), and 4(b).

[0038] Equivalent ratios in the above represent an ideal state. When requirement on the shape of the workpiece 8 is not high, the range thereof is relatively wide, or the manufacturing of the grinding wheel is excessively difficult, a proper difference is permitted between the proportional constant C and the ratios C_n which refers ratios between the total circumference lengths L_n of the entity processing region allocated at different positions in the axial direction of the grinding wheel and the machining allowances Δn at corresponding positions of the workpiece 8. The amplitude of the difference between the proportional constant C and the ratio C_n satisfies the requirement on an indicator of a specific shape error of the workpiece 8. Furthermore, the shape error occurs in the entity processing region 2-2 because of manufacture error. Thus, a difference between the practical ratio and

the theoretical ratio is finally resulted, and the corresponding relation is an approximate proportion relation which is resulted from the shape error of the workpiece 8 and the manufacturing error of the grinding wheel and is conditional approximation. Under the influence of the above factors, variances exist between ratios between the total circumference lengths L_n at different positions in the axial direction and the machining allowances Δn at corresponding positions of the workpiece 8. The smaller the variance is, the closer the ratio is to the proportional constant C , and the better the effect of the equivalent-shaped abrasion.

[0039] As shown in FIG. 5, the material of the workpiece 8 has a thickness of 5 mm, an arch rise of the arc of 1.5 mm, a minimum machining allowance (corresponding to a middle portion in a direction of the thickness) of 1 mm, and a maximum machining allowance (corresponding to right and left end faces) of 2.5 mm. Thus, the proportion relation between the machining allowance in the axial direction of the workpiece 8 and the total circumference length at corresponding position of the entity processing region 2-2 is: minimum machining allowance : maximum machining allowance = 1: 2.5.

[0040] As shown in FIG. 4(a), when an axial width of the water outlet 2-1 is larger than the thickness of the processing face of the workpiece 8, a micro-distance discontinuous grinding structure or a semi-discontinuous grinding structure is formed. The semi-discontinuous grinding structure has much smaller beating, thereby being beneficial to process those having high requirement on the edge collapse. When the edge collapse is highly required, the axial width of the water outlet 2-1 is larger than the thickness of the processing face of the workpiece 8 to form a continuous grinding structure, thereby eliminating the edge collapse resulting from beating, as shown in FIG. 4(b).

[0041] The grinding wheel of the invention has the inner cooling structure and is applicable to an outer cooling grinding machine. The water inlet 3 of the cooling water is a ring-shaped mouth disposed between the ring-shaped press plate 1-2 and the base plate 1-1. A cavity between the base plate 1-1 and the ring-shaped press plate 1-2 is a water storage region 5 for storing the cooling water. The water outlets 2-1 communicate with the water storage region 5, as shown in FIGS. 1 and 3.

[0042] When using the grinding wheel to grind the workpiece, a cooling pipe of the outer cooling grinding machine is aligned with the ring-shaped mouth (the water inlet 3) between the center axel 7 of the base plate 1-1 and the ring-shaped press plate 1-2. The cooling water is introduced from the ring-shaped mouth into the water storage region 5 and is stored therein. Under the action of the centrifugal force, the cooling water in the water storage region 5 is discharged on the grinding region via the water outlets 2-1 (the circular or oval through holes), thereby realizing the inner cooling of the workpiece 8. Chips produced in the grinding enter the water outlets 2-1 (the circular or oval through holes) and are temporarily

accommodated therein. When the outlets stored with chips move far from the grinding face along with the rotation of the grinding wheel, the chips therein are smoothly discharged under the action of the centrifugal force and the water flow.

[0043] The grinding wheel of the invention is capable of timely and fast discharging the chips from the grinding wheel, thereby ensuring a relatively good exposing height of the abrasive grains, being conducive to improve the grinding performance of the abrasive grains, and improving the sharpness. Meanwhile, because the chips are fast discharged, it is conducive to the action of the cooling water, the grinding heat of the abrasive grains and the frictional heat resulting from the existence of the chips are largely decreased, the working conditions of the abrasive grains are improved, the intensity of the grinding grains is ensured, and the service life of the grinding wheel is prolonged. Furthermore, the decrease of the frictional heat is helpful to improve the surface quality of the workpiece 8.

[0044] Special condition: when the grinding face is complicate and special-shaped, the complicate special-shaped face is divided into a plurality of sections, and a plurality of corresponding grinding wheels are used, which can be viewed as a superposition of many grinding wheels. When two or more than two grinding wheels are arranged co-axially in parallel for using, water channels (the water storage region 5) of the grinding wheels 1 communicate with one another.

[0045] The technical solution of the invention is particularly applicable to process rigid metals or non-metal materials. The grinding ring 2 of the grinding wheel is made of a superhard abrasive. The entity processing region 2-2 of the grinding ring 2 is formed by one-step formation or by combining formation.

Claims

1. An anti-deforming and highly efficient grinding wheel, comprising a base (1) and a grinding ring (2) disposed on the base (1); the grinding ring (2) comprising a grinding face comprising water outlets (2-1) passing through the grinding ring (2); the water outlets (2-1) each communicating with a corresponding water channel disposed inside the base (1), and the water channels being connected to a water inlet (3); **characterized in that** a number of the water outlets (2-1) in an arc length on the grinding face is more than zero, wherein the arc length is between one and three times a contact line length between the grinding ring (2) and a workpiece (8) during grinding; the grinding face is a special-shaped grinding face; the water outlets (2-1) are a non-entity processing region for washing, and a remaining part of the special-shaped grinding face is an entity processing region (2-2) for grinding; and

total circumference lengths at different axial positions of the entity processing region (2-2) are proportional to or approximately proportional to machining allowances at corresponding positions of the workpiece (8), respectively.

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2. The grinding wheel of claim 1, **characterized in that** the number of the water outlets (2-1) is smaller than or equal to 30.

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3. The grinding wheel of claim 1 or 2, **characterized in that** each water outlet (2-1) is in a regular geometric shape or an irregular geometric shape.

4. The grinding wheel of claim 1 or 2, **characterized in that** an axial width of each water outlet (2-1) is larger than a thickness of a processing face of the workpiece (8).

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5. The grinding wheel of claim 1 or 2, **characterized in that** an axial width of each water outlet (2-1) is smaller than a thickness of a processing face of the workpiece (8).

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6. The grinding wheel of claim 1 or 2, **characterized in that** the water inlet (3) is disposed on an axle hole of a center axle (7) disposed on an axial position of the base (1) or disposed on the base (1); and the water inlet (3) is a mouth facing outward.

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7. The grinding wheel of claim 6, **characterized in that** the base (1) comprises two base plates (1-1); the grinding ring (2) is clamped between the two base plates (1-1); a water storage region (5) functioning as the water channel forms between the two base plates (1-1); and the water inlet (3) is disposed on one base plate (1-1), and the center axle (7) is disposed on the other base plate (1-1).

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8. The grinding wheel of claim 7, **characterized in that** the water inlet (3) is a ring-shaped mouth disposed on the base plate (1-1).

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9. The grinding wheel of claim 8, **characterized in that** the base plate (1-1) provided with the ring-shaped mouth is a ring-shaped press plate (1-2); a diameter of an inner ring of the ring-shaped press plate (1-2) is larger than the center axle (7); and the ring-shaped mouth is produced between the inner ring of the ring-shaped press plate (1-2) and the center axle (7).

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10. The grinding wheel of claim 6, **characterized in that** when two or more than two grinding wheels are arranged co-axially in parallel for using, the water channels of the grinding wheels (1) communicate with one another.

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11. The grinding wheel of claim 1 or 2, **characterized**

in that the grinding ring (2) is made of a superhard abrasive; and the entity processing region (2-2) of the grinding ring (2) is formed by one-step formation or by combining formation.

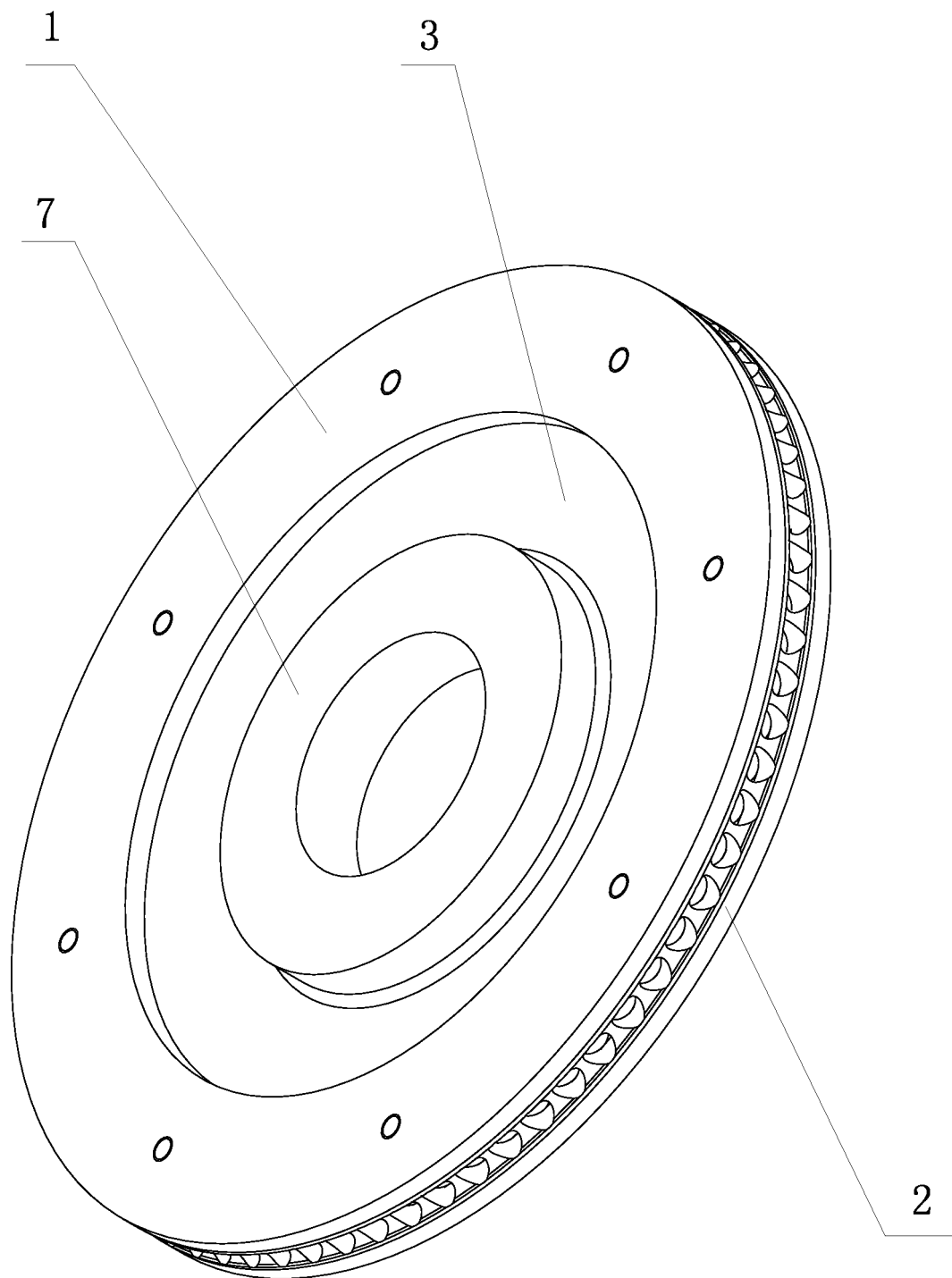


FIG. 1

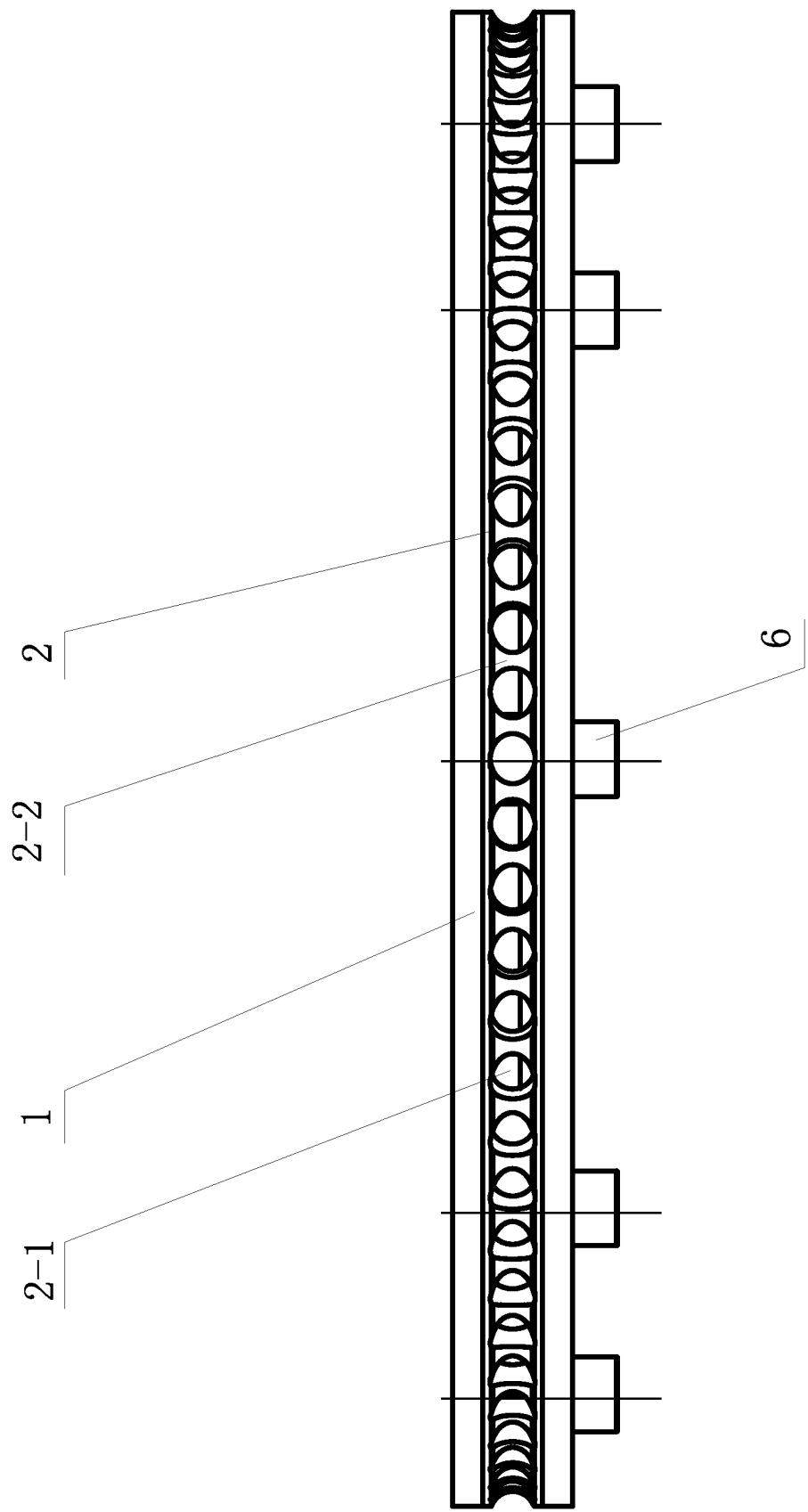


FIG. 2

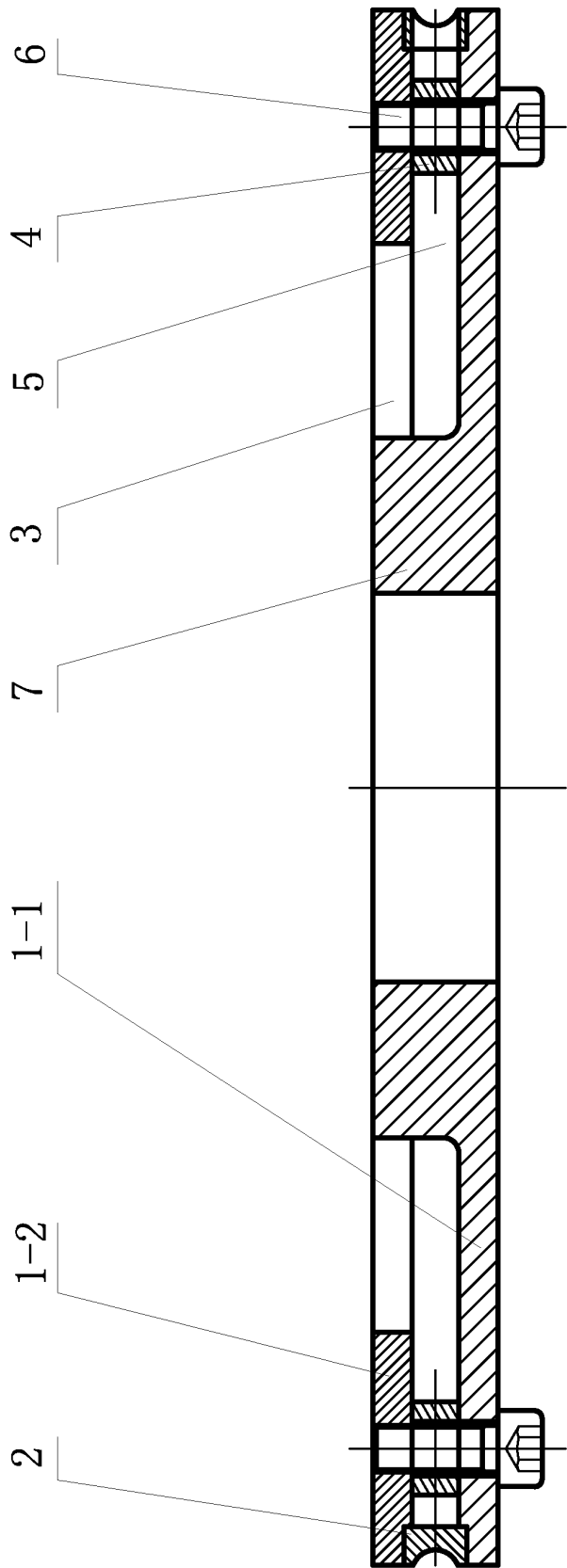


FIG. 3

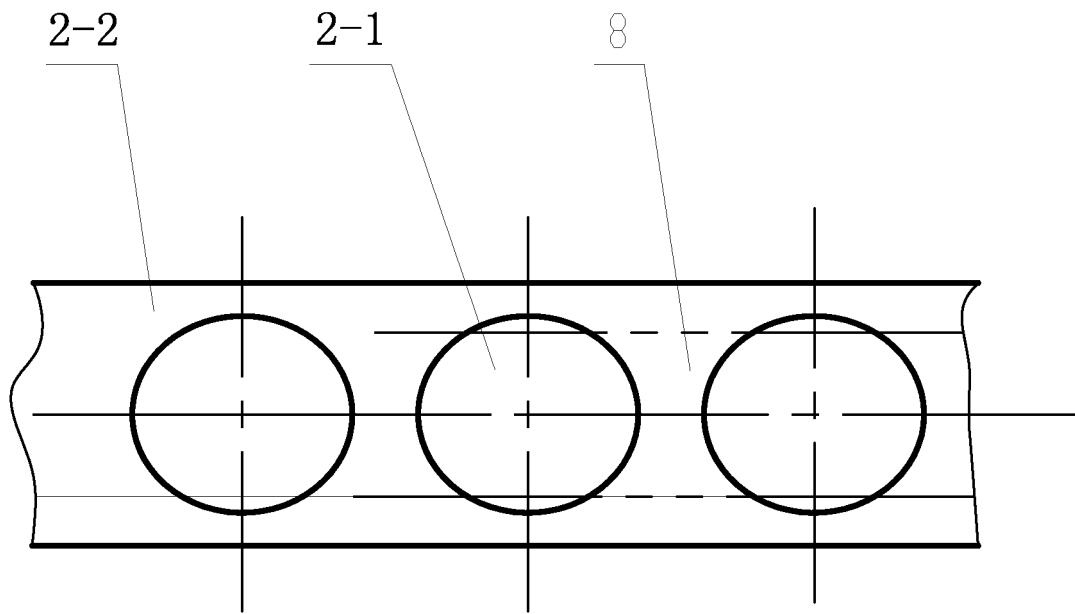


FIG. 4(a)

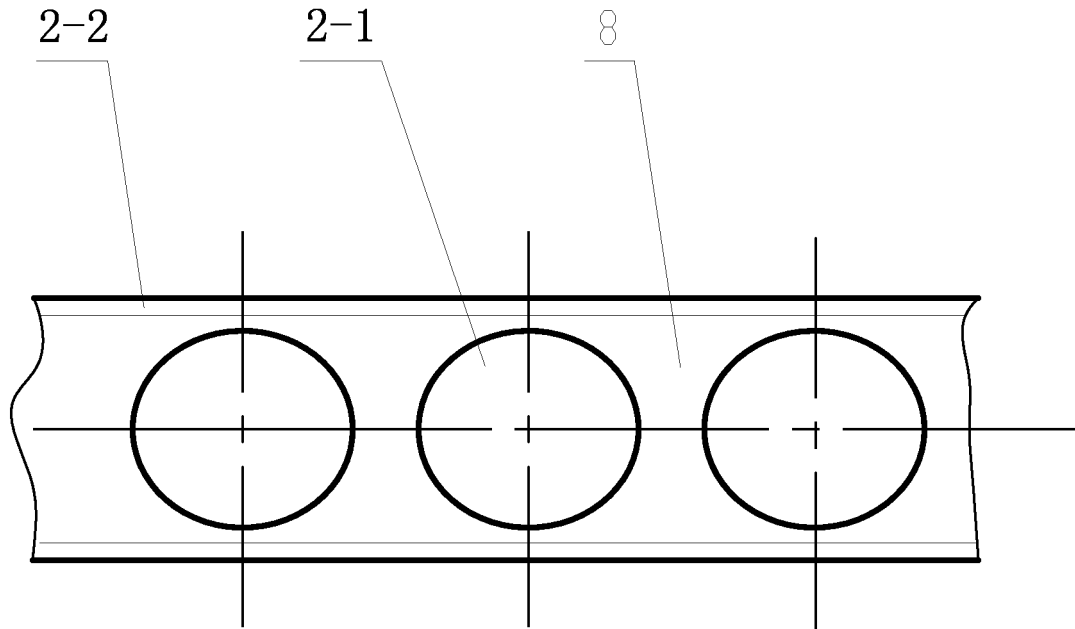


FIG. 4(b)

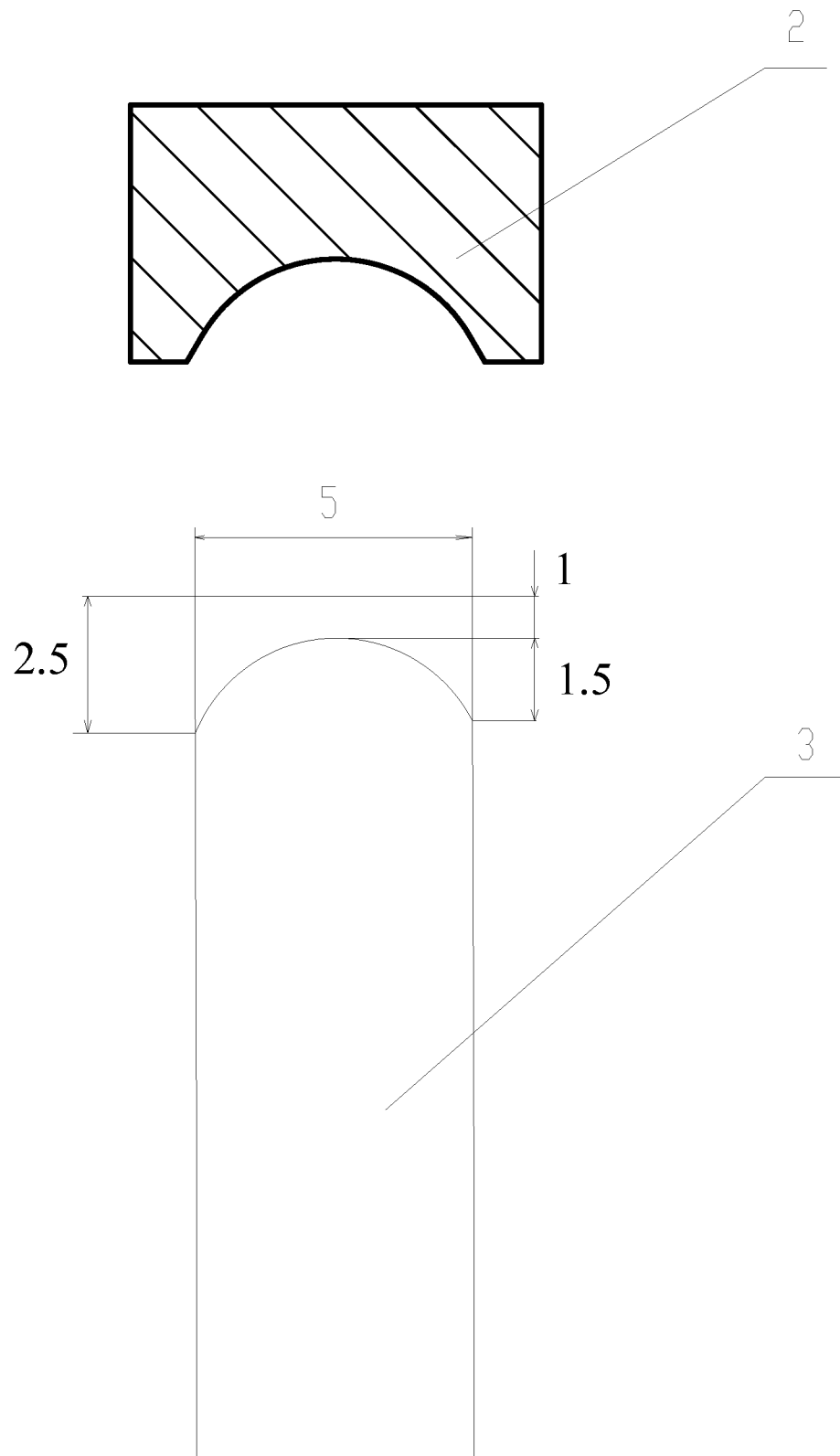


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/070506

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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: B24D 5, B24D 7, B24B 55, B28D 1, B23F 21, B23F 9, B23F 5, B24D 55, B24B 1, B24D 3, B24B 13

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

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

CNPAT, EPODOC, WPI, CNKI: profiled grinding wheel, profiled wheel, grinding wheel, abrasive disk, abrasion wheel, carborundum wheel, emery wheel, sandstone wheel, grinding disc, contact wire, line of contact, contact, groove, slot, hole, cool+, greasing, lubricat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PY	CN 102528677 A (GUILIN CHAMPION UNION DIAMOND CO., LTD.), 04 July 2012 (04.07.2012), see description, pages 4-6, and figures 1-5	1-6, 10-11
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☒ 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
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"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search
27 March 2013 (27.03.2013)Date of mailing of the international search report
18 April 2013 (18.04.2013)Name and mailing address of the ISA/CN:
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/070506

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	DE 3415498 A1 (WERKZEUGMASCH OKT VEB), 29 November 1984 (29.11.1984), see the whole document	1-11

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Information on patent family members

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

B24D 5/10 (2006.01) i

B24D 5/12 (2006.01) i