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(71) Applicant: **China Railway Engineering Equipment Group Co., Ltd.**
Zhengzhou, Henan 450016 (CN)

(72) Inventors:
• **ZHUO, Puzhou**
Zhengzhou, Henan 450016 (CN)
• **JIA, Lianhui**
Zhengzhou, Henan 450016 (CN)
• **JIANG, Lijie**
Zhengzhou, Henan 450016 (CN)
• **WEN, Yongliang**
Zhengzhou, Henan 450016 (CN)
• **YANG, Hang**
Zhengzhou, Henan 450016 (CN)
• **ZHAO, Mengyuan**
Zhengzhou, Henan 450016 (CN)
• **YUAN, Xiaowei**
Zhengzhou, Henan 450016 (CN)

(74) Representative: **Ipside**
7-9 Allées Haussmann
33300 Bordeaux Cedex (FR)

(54) **NEW EASILY REPLACEABLE HOB CUTTER SYSTEM AND INSTALLATION METHOD THEREOF**

(57) Provided are a new-type easily replaceable hob cutter system and a mounting method therefor. The system comprises a cutter holder (1) and a hob (4), the hob (4) being connected to the cutter holder (1) by means of a cutter shaft holder (2), and the cutter shaft holder (2) being fixedly connected to the cutter holder (1) by means of a telescopic tensioning mechanism (3) or a locking mechanism (5). The hob cutter system is designed to have three parts including the cutter holder, the cutter shaft holder, and the locking mechanism or the telescopic tensioning mechanism, so as to change the structure of a conventional cutter system, which makes the hob mounting, locking and removal process simpler, facilitates the automation of cutter replacement, and provides technical support for the efficient and safe "substituting labor with machine" operation mode for the cutter detection and cutter replacement operations.

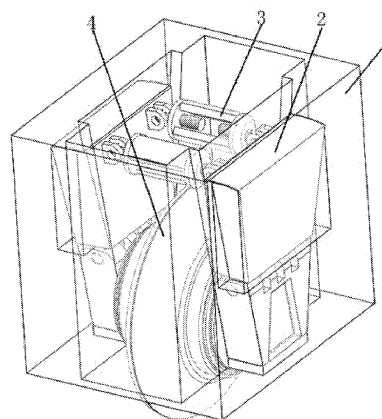


FIG. 1

Description

Technical Field

[0001] The present invention relates to the technical field of tunnel construction, and in particular to a new-type easily replaceable hob cutter system and a mounting method therefor.

Background Art

[0002] During the construction with a full-face tunnel boring machine, cutters are consumed significantly and replaced frequently, and the cutter replacement operation time accounts for more than 10% of the tunnel construction period. The existing cutter replacement operation mainly relies on manual operation, and there are high potential safety hazards in construction environments with large burial depth, high water pressure, etc., easily causing major safety accidents such as casualties. According to statistics, nearly 70% of tunnel construction safety accidents in China are directly related to manual cutter replacement operations, and the international industry problem of "cutter replacement risk" has become a bottleneck that restricts the safety and efficiency of tunnel construction under complex geological conditions. It is expected that by 2022, the total length of tunnels for subway, highway, railway, etc. in China will exceed 10,000 kilometers, of which medium-long and extra-long tunnels account for about 2/3. The huge market demand puts forward higher requirements for the construction efficiency and safety of full-face tunneling equipment. At present, in a shield tunneling machine or a TBM, a disc hob cutter is mainly fixed on a cutter holder by means of connection of C-shaped blocks and bolts. Although this method has high reliability, it requires multi-person cooperation for disassembly, which is time-consuming and labor-intensive, and this mounting method is difficult to achieve the automation of cutter replacement. Therefore, it is urgent to implement the cutter detection and cutter replacement operation with an efficient and safe "substituting labor with machine" operation mode. To achieve efficient and fast cutter replacement by machine, the original cutter system needs to be improved. To solve this problem, it is necessary to propose a new-type hob cutter system adapted for quick disassembly and assembly.

Summary of the Invention

[0003] In view of the above-mentioned deficiencies in the background art, the present invention proposes a new-type easily replaceable hob cutter system and a mounting method therefor, which solves the problems of difficult hob replacement and low automation of replacement in the prior art.

[0004] The technical solution of the present invention is implemented as follows: a new-type easily replaceable hob cutter system, comprising a cutter holder and a hob,

the hob being connected to the cutter holder by means of a cutter shaft holder, wherein the cutter shaft holder is fixedly connected to the cutter holder by means of a telescopic tensioning mechanism or a locking mechanism.

[0005] The inner wall of the cutter holder is symmetrically provided with a mounting groove, with the upper top face of the mounting groove being an arc-shaped face.

[0006] The cutter shaft holder comprises a fixed block and a swing block, the swing block being located at the upper portion of the fixed block and hinged with the fixed block, and the hob being connected to the fixed block; and the fixed block and the swing block both fit with the mounting groove, the upper surface of the swing block is an arc-shaped face, the arc-shaped face of the swing block fits with the arc-shaped face of the mounting groove, and the inner side face of the swing block is provided with a connecting lug.

[0007] The telescopic tensioning mechanism comprises a support frame, a first lead screw and a second lead screw; one end of the first lead screw is hinged with the connecting lug, and the other end thereof is in threaded connection with the support frame; and one end of the second lead screw is hinged with the corresponding connecting lug, and the other end thereof is in threaded connection with the corresponding side of the support frame, with the thread direction of the first lead screw being opposite the thread direction of the second lead screw.

[0008] The locking mechanism is a screw rod and sliding block mechanism comprising a screw rod and a sliding block, with one end of the screw rod being connected to the sliding block, and the other end thereof being connected to the cutter shaft holder or the cutter holder.

[0009] The cutter holder is provided with a first limiting block, and the outer side of the first limiting block is provided with a No. V wedge face; the cutter shaft holder is provided with a cutter shaft sliding channel, and the sliding block is arranged in the cutter shaft sliding channel; and the sliding block is provided with a No. VI wedge face, and the No. VI wedge face fits with the No. V wedge face.

[0010] The upper portion of the sliding block is provided with a cylindrical channel, the upper end of the screw rod passes through the sliding block and then extends into the cylindrical channel, and the screw rod is in threaded connection with the sliding block; and the lower end of the screw rod is a spherical face, a conical face or a cylindrical face, and the lower end of the screw rod is connected to the cutter shaft holder.

[0011] Both ends of the cutter shaft holder are provided with a protruding block I, with the outer surface of the protruding block I being a No. I wedge face, and the upper surface of protruding block I being a No. II wedge face.

[0012] The cutter holder is a cylinder, the inner wall of the cutter holder is provided with a first convex ring, and a limiting sliding channel is formed between the convex ring and the first limiting block; the bottom face of the limiting sliding channel is a No. III wedge face, and the

upper side face of the limiting sliding channel is a No. IV wedge face; and the No. III wedge face fits with the No. I wedge face, and the No. IV wedge face fits with the No. II wedge face.

[0013] The cutter holder is provided with a cutter holder sliding channel, the cutter shaft holder is provided with a cutter shaft fixture slot, and the lower portion of the cutter holder sliding channel abuts with the upper portion of the cutter shaft fixture slot; and the sliding block is arranged in the cutter holder sliding channel.

[0014] The lower end of the screw rod is a spherical face, a conical face or a cylindrical face, and the lower end of the screw rod extends into the sliding block; and the screw rod is in threaded connection with the cutter holder.

[0015] Both ends of the cutter shaft holder are provided with a protruding block II, with the outer surface of the protruding block II being a first wedge face, and the upper surface of the protruding block II being a second wedge face.

[0016] The cutter holder is a cylinder, the inner wall of the cutter holder is provided with a second convex ring and a second limiting block, and a second limiting sliding channel is formed between the second convex ring and the second limiting block; the bottom face of the second limiting sliding channel is a third wedge face, and the upper side face of the second limiting sliding channel is a fourth wedge face; and the third wedge face fits with the first wedge face, and the fourth wedge face fits with the second wedge face.

[0017] The side face of the cutter shaft fixture slot is a fifth wedge face, one side face of the sliding block is a sixth wedge face, and the fifth wedge face fits with the sixth wedge face.

[0018] The locking mechanism is a screw panel and sliding block mechanism comprising a fixture block, a horizontal sliding block is provided and fits with the fixture block in a sliding manner, a fixture panel is provided on the horizontal sliding block, the middle of the fixture panel is provided with a rotating shaft, and the fixture panel is provided with a fixture plate.

[0019] The fixture block is provided with a No. I sliding channel and a No. II sliding channel, the No. I sliding channel and the No. II sliding channel are arranged symmetrically, the horizontal sliding block comprises a No. I sliding block panel and a No. II sliding block, the No. I sliding block fits with the No. I sliding channel, and the No. II sliding block fits with the No. II sliding channel; and the fixture panel fits with the No. I sliding block and the No. II sliding block in a threaded manner.

[0020] The lower portion of the fixture block is provided with a fixture leg, and the fixture leg is provided with a No. G wedge face; and the outer side of the sliding block is provided with a clamping block, and the outer side of the clamping block is provided with a No. H wedge face.

[0021] The cutter holder is a cylinder, the inner wall of the cutter holder is provided with a third convex ring and a third limiting block, and a third limiting sliding channel

is formed between the third convex ring and the third limiting block.

[0022] One side of the third limiting block is connected to the cutter holder, and the other side thereof is provided with a weight reduction recess; the inner wall of the cutter holder is further provided with a clamping slot, the upper side face of the clamping slot is a No. F wedge face, and the No. F wedge face fits with the No. H wedge face; the bottom face of the third limiting sliding channel is a No. E wedge face, and the upper side face of the third limiting sliding channel is a No. D wedge face; and after being loaded in the cutter holder, the cutter slides in the third limiting sliding channel, supported by the third convex ring.

[0023] The cutter shaft holder is provided with a protruding block III on opposite sides, the side face of the protruding block III is a No. A wedge face, the upper portion of the protruding block III is a No. B wedge face, and the other two sides of the cutter shaft holder are provided with a No. C wedge face.

[0024] A mounting method for the new-type easily replaceable hob cutter system, comprising the steps as follows: in S1, the hob is firstly mounted on the fixed block of the cutter shaft holder to form a hob and cutter shaft holder assembly; in S2, the hob and cutter shaft holder assembly is then loaded as a whole into the cutter holder; and in S3, finally, the swing block of the cutter shaft holder is driven by the telescopic tensioning mechanism to axially swing, such that the cutter shaft holder is pushed against the cutter holder, thereby completing the mounting of the cutter.

[0025] A mounting method for the new-type easily replaceable hob cutter system, comprising the steps as follows: 1) mounting of the hob, in which the cutter shaft holder with the hob is firstly loaded into the cutter holder, and the cutter shaft holder is rotated when reaching a limit position, until the cutter shaft holder is in a clamped state in the cutter holder; and 2) locking of the locking mechanism, in which the screw rod on the locking mechanism is rotated such that the sliding block moves in the cutter shaft sliding channel on the cutter shaft holder, and when extending out and reaching the limit position, the sliding block abuts against the No. V wedge face on the cutter holder, such that the cutter shaft holder and the cutter holder are in a close-fit state.

[0026] In the step 1), when the cutter shaft holder is in the clamped state in the cutter holder, the No. I wedge face on the cutter shaft holder fits with the No. III wedge face on the cutter holder, and the No. II wedge face on the cutter shaft holder fits with the No. IV wedge face on the cutter holder until the cutter shaft holder is in the clamped state in the cutter holder.

[0027] A mounting method for the new-type easily replaceable hob cutter system, comprising the steps as follows: 1) mounting of the hob, in which the cutter shaft holder with the hob is firstly loaded into the cutter holder, and the cutter shaft holder is rotated when reaching a limit position, until the cutter shaft holder is in a clamped

state in the cutter holder; and 2) locking of the locking mechanism, in which the screw rod on the locking mechanism is rotated such that the sliding block moves downwards and is clamped into the cutter shaft fixture slot on the cutter shaft holder, such that the cutter shaft holder and the cutter holder are always in a close-fit state.

[0028] In the step 1), when the cutter shaft holder is in the clamped state in the cutter holder, the first wedge face on the cutter shaft holder fits with the third wedge face on the cutter holder, and the second wedge face on the cutter shaft holder fits with the fourth wedge face on the cutter holder until the cutter shaft holder is in the clamped state in the cutter holder.

[0029] A mounting method for the new-type easily replaceable hob cutter system, comprising the steps as follows: 1) mounting of the cutter, in which the cutter shaft holder with the hob is firstly loaded into the cutter holder, and the cutter shaft holder is rotated when reaching a limit position, until the cutter shaft holder is in a clamped state in the cutter holder; 2) locking of the locking mechanism, in which after the cutter shaft holder is mounted, the locking mechanism is loaded into the cutter holder, such that the locking mechanism locks the cutter shaft holder to prevent the cutter shaft holder from loosening; and 3) clamping of the cutter shaft holder, in which after the locking mechanism is mounted, the locking mechanism is locked by means of rotating the fixture panel such that the cutter shaft holder, the locking mechanism and the cutter holder are always in a close-fit state.

[0030] In the step 1), when the cutter shaft holder is in the clamped state in the cutter holder, the No. A wedge face on the cutter shaft holder and the No. E wedge face on the cutter holder are fitted in wedge face, and the No. B wedge face on the cutter shaft holder and the No. D wedge face on the cutter holder are fitted in wedge face.

[0031] In the step 2), after the locking mechanism is loaded into the cutter holder, the No. C wedge face on the cutter shaft holder and the No. G wedge face on the fixture block form a fitting face.

[0032] In the step 3), by means of rotating the fixture panel, the No. I sliding block and the No. II sliding block move along the sliding channel of the fixture block, such that the No. I sliding block and the No. II sliding block simultaneously extend out and are clamped into the clamping slot in the cutter holder, and as the rotating shaft rotates, the No. H wedge face fits with the No. F wedge face in the clamping slot until the locking mechanism is locked.

[0033] In the present invention, the hob cutter system is designed to have three parts including the cutter holder, the cutter shaft holder, and the locking mechanism or the telescopic tensioning mechanism, so as to completely change the structure of a conventional cutter system, which makes the hob mounting, locking and removal process simpler, facilitates the automation of cutter replacement, and provides technical support for the efficient and safe "substituting labor with machine" operation mode for the cutter detection and cutter replacement op-

erations. The present invention is ingenious in design and compact in structure, achieves the quick disassembly and replacement of the hob, facilitates automatic mounting, improves the efficiency of disassembly and assembly, greatly saves on the labor and material resources, and improves the safety factor of construction, and is a major innovation in hob design.

Brief Description of the Drawings

[0034] In order to explain the embodiments of the present invention more clearly, the drawings used in the description of the embodiments will be briefly introduced below. Obviously, the drawings in the following description are only some of the embodiments of the present invention, and for those of ordinary skill in the art, other drawings would also have been obtained from these drawings without involving any inventive effort.

Fig. 1 is a schematic diagram of the overall structure of the present invention in Embodiment 1;

Fig. 2 is a schematic diagram of a connection structure between a cutter shaft holder and a telescopic tensioning mechanism in Embodiment 1;

Fig. 3 is a structural schematic diagram of the fitting state of the cutter shaft holder and the cutter holder in Embodiment 1;

Fig. 4 is a schematic diagram in which the cutter shaft holder, the telescopic tensioning mechanism and a hob are loaded in the cutter holder in Embodiment 1;

Fig. 5 is a schematic diagram of a state in which a swing block is pushed against the cutter holder in Embodiment 1.

Fig. 6 is a schematic diagram of the structure of the present invention in Embodiment 2;

Fig. 7 is a structural schematic diagram of the fitting between the cutter shaft holder and the cutter holder of the present invention in Embodiment 2;

Fig. 8 is a schematic diagram of the internal structure of the cutter holder of the present invention in Embodiment 2;

Fig. 9 is a schematic diagram of the structure of the cutter shaft holder of the present invention in Embodiment 2;

Fig. 10 is a structural schematic diagram of the fitting between the cutter shaft holder, a locking mechanism and the cutter holder of the present invention in Embodiment 2;

Fig. 11 is a structural schematic diagram of the locking mechanism of the present invention in Embodiment 2.

Fig. 12 is a structural schematic diagram of the present invention in Embodiment 3;

Fig. 13 is a schematic diagram of the structure of the cutter shaft holder of the present invention in Embodiment 3;

Fig. 14 is a schematic diagram of the internal struc-

ture of the cutter holder of the present invention in Embodiment 3;

Fig. 15 is a structural schematic diagram the fitting between the cutter shaft holder and the locking mechanism of the present invention in Embodiment 3;

Fig. 16 is a structural schematic diagram of the fitting of the cutter holder and the locking mechanism of the present invention in Embodiment 3.

Fig. 17 is a structural schematic diagram of the present invention in Embodiment 4;

Fig. 18 is a structural schematic diagram of the cutter shaft holder of the present invention in Embodiment 4;

Fig. 19 is a structural schematic diagram of the locking mechanism of the present invention in Embodiment 4;

Fig. 20 is a partial cross-sectional structural schematic diagram of the fitting between the cutter shaft holder and the cutter holder of the present invention in Embodiment 4;

Fig. 21 is a schematic diagram of the internal structure of the cutter holder of the present invention in Embodiment 4; and

Fig. 22 is a partial cross-sectional structural schematic diagram of the fitting between the cutter cylinder and the locking mechanism of the present invention in Embodiment 4.

Detailed Description of Embodiments

[0035] The technical solutions of the embodiments of the present application will be described below clearly and comprehensively in conjunction with the drawings of the embodiments of the present invention. Obviously, the embodiments described are merely some embodiments of the present invention and are not all the possible embodiments. All the other embodiments, which are obtained by means of a person of ordinary skill in the art based on the embodiments of the present invention without involving any inventive effort, shall fall within the scope of protection of the present invention.

[0036] As shown in Fig. 1, in Embodiment 1, a new-type easily replaceable hob cutter system comprises a cutter holder 1 and a hob 4. The hob 4 is connected to the cutter holder 1 by means of a cutter shaft holder 2, and the cutter shaft holder 2 is provided with a cutter shaft channel. The cutter shaft of the hob extends into the cutter shaft channel, and the channel opening of the cutter shaft channel is provided with a cutter shaft holder baffle. The cutter shaft is fixedly connected to the cutter shaft holder by means of the cutter shaft holder baffle. The cutter shaft holder 2 is fixedly connected to the cutter holder 1 by means of a telescopic tensioning mechanism 3. That is, the cutter shaft holders on both sides are connected by the telescopic tensioning mechanism, and under the telescopic action of the telescopic tensioning mechanism, the cutter shaft holders are tightly supported

in the cutter holder to achieve the fixing of the hob.

[0037] Further, as shown in Figs. 2 and 3, the inner wall of the cutter holder 1 is symmetrically provided with a mounting grooves 6, with the upper top face of the mounting groove 6 being an arc-shaped face. That is, the longitudinal section of the mounting groove 6 is of a vertically arranged concave shape, and the upper top face of the vertically arranged concave groove is of an arc shape, which facilitates the swing support of the cutter shaft holder 2. The cutter shaft holder 2 comprises a fixed block 201 and a swing block 202. The swing block 202 is located on an upper portion of the fixed block 201 and is hinged with the fixed block 201, the swing block 202 is hinged with the upper portion of the fixed block by means of a pin shaft, and the swing block can swing around the pin shaft. The hob 4 is connected to the fixed block 201; and the fixed block 201 and the swing block 202 both fit with the mounting groove 6, that is, the fixed block 201 and the swing block 202 are both mounted in the mounting groove 5, the upper surface of the swing block 202 is an arc-shaped face, the arc-shaped face of the swing block 202 fits with the arc-shaped face of the mounting groove 6, the path of the swing block is of an arc shape during the swing process, and the arc-shaped face is designed to prevent interference with the cutter holder during the swing process, and also ensure the precise fitting between the swing block and the cutter holder, thereby improving the stability of the hob mounting. The inner side face of the swing block 202 is provided with a connecting lug 203. The telescopic tensioning mechanism 3 is hinged with the swing block by means of the lug, and drives the swing block to move in an axial motion to push against the cutter holder to achieve quick disassembly and replacement, which can achieve automatic mounting and improve the disassembly and assembly efficiency.

[0038] Further, as shown in Figs. 4 and 5, the telescopic tensioning mechanism 3 comprises a support frame 301, a first lead screw 302, and a second lead screw 303, with both ends of the support frame 301 being provided with a screw hole. One end of the first lead screw 302 is hinged with the connecting lug 203, and the other end thereof is in threaded connection with the screw hole on one side of the support frame 301; and one end of the second lead screw 303 is hinged with the connecting lug 203 on the swing block of on the other side, and the other end thereof is in threaded connection with the screw hole on the other side of the support frame 301, that is, the first lead screw 302 and the second lead screw 303 are respectively located on two sides of the support frame. The first lead screw 302 and the second lead screw 303 are located on the same straight line, and the thread direction of the first lead screw 302 is opposite the thread direction of the second lead screw 303. The rotation of the support frame can achieve the axial movement of the first lead screw and the second lead screw along the support frame so as to achieve the telescopic function thereof.

[0039] The mounting method for the above-mentioned new-type easily replaceable hob cutter system comprises the steps as follows: in S1, the hob 4 is firstly mounted on the fixed block 201 of the cutter shaft holder 2 to form a hob and cutter shaft holder assembly; in S2, the hob and cutter shaft holder assembly is then loaded as a whole into the cutter holder 1, that is, the fixed block 201 and the swing block 202 are both mounted in the mounting groove 5; and in S3, finally, the swing block 202 of the cutter shaft holder 2 is driven by the telescopic tensioning mechanism 3 to swing axially, that is, swing to both sides in the axial direction of the cutter shaft, such that the cutter shaft holder 2 is pushed against the cutter holder 1, thereby completing the mounting of the cutter.

[0040] As shown in the figures, in Embodiment 2, a new-type easily replaceable hob cutter system is provided. The cutter shaft holder 2 is fixedly connected to the cutter holder 1 by means of a locking mechanism 5. The locking mechanism 5 is a screw rod 501 and a sliding block 502, with one end of the screw rod 501 being connected to the sliding block 502, and the other end thereof being connected to the cutter shaft holder 2. The sliding block 502 of the locking mechanism 5 is clamped into the cutter shaft holder 2, and fits with the first limiting block 105 of the cutter shaft holder 2 to prevent the cutter shaft from rotating. The cutter shaft holder is provided with a cutter shaft channel, and the cutter shaft of the hob extends into and fixed to the cutter shaft channel. The upper end of the screw rod 501 is provided with a fixture panel, and the screw rod is screwed by means of the end effector of the robot, which facilitates the automatic mounting and disassembly of the cutter system. The other structure is the same as that in Embodiment 1.

[0041] Further, the cutter holder 1 is provided with a first limiting block 105, the outer side of the first limiting block 105 is provided with a No. V wedge face 103, and the first limiting block 105 is symmetrically arranged on the inner wall of the cutter holder and is flush with the cutter holder; the cutter shaft holder 2 is provided with a cutter shaft sliding channel 2-3, and the sliding block 502 is arranged in the cutter shaft sliding channel 2-3; and the sliding block 502 is provided with a No. VI wedge face 503, and the No. VI wedge face 503 fits with the No. V wedge face 103.

[0042] Further, the upper portion of the sliding block 502 is provided with a cylindrical channel 504, the upper end of the screw rod 501 passes through the sliding block 502 and then extends into the cylindrical channel 504, and the screw rod 501 is in threaded connection with the sliding block 502; and the upper end of the screw rod 501 does not extend out of the cylindrical channel 504 to prevent affection to the mounting of the cutter shaft holder. When the screw rod is screwed, the screwing device needs to be extended into the cylindrical channel to come into contact with the upper end of the screw rod. The lower end of the screw rod 501 is a spherical face, a conical face or a cylindrical face, and the lower end of

the screw rod 501 is connected to the cutter shaft holder 2. The lower end of the screw rod 501 is clamped in the cutter shaft holder 2, and with the cutter shaft holder 2 as the bottom face, the sliding block 502 can be driven to slide upwards or downwards.

[0043] Further, both ends of the cutter shaft holder 2 are provided with a protruding block I 2-4, with the outer surface of the protruding block I 2-4 being a No. I wedge face 2-1, and the upper surface of protruding block I 2-4 being a No. II wedge face 2-2. The cutter holder 1 is a cylinder, the inner wall of the cutter holder 1 is provided with a first convex ring 104, and a limiting sliding channel 106 is formed between the first convex ring 104 and the first limiting block 105; and after being mounted into the cutter holder, the cutter shaft holder slides in the limiting sliding channel, supported by the first convex ring 104. The bottom face of the limiting sliding channel 106 is a No. III wedge face 101, and the upper side face of the limiting sliding channel 106 is a No. IV wedge face 102; and the No. III wedge face 101 fits with the No. I wedge face 2-1, and the No. IV wedge face 102 fits with the No. II wedge face 2-2. The screw rod 501 on the locking device 5 is connected to the sliding block 502 in a threaded manner, the screw rod 501 on the locking device 5 is connected to the cutter shaft holder 2 through the bottom rotation face such as a spherical face, a conical face, a cylindrical face, etc., the screw rod 501 rotates, and the sliding block moves in the cutter shaft sliding channel 2-3 and extends out of the cutter shaft sliding channel 2-3; and after extending out, the sliding block abuts against the No. V wedge face 103, thereby preventing the axial rotation of the cutter shaft holder 2.

[0044] The mounting method for the above-mentioned new-type easily replaceable hob cutter system comprises the steps as follows: 1) mounting of the hob, in which the cutter shaft holder 2 with the hob is firstly loaded into the cutter holder 1, and the cutter shaft holder 2 is rotated when reaching a limit position, until the cutter shaft holder 2 is in a clamped state in the cutter holder 1; and 2) locking of the locking mechanism 5, in which the screw rod 501 on the locking mechanism 5 is rotated such that the sliding block 502 moves in the cutter shaft sliding channel 2-3 on the cutter shaft holder 2, and when extending out and reaching the limit position, the sliding block 502 abuts against the No. V wedge face 303 on the cutter holder 1, such that the cutter shaft holder 2 and the cutter holder 1 are in a close-fit state.

[0045] In the step 1), when the cutter shaft holder 2 is in the clamped state in the cutter holder 1, the No. I wedge face 2-1 on the cutter shaft holder 2 fits with the No. III wedge face 101 on the cutter holder 1, and the No. II wedge face 2-2 on the cutter shaft holder 2 fits with the No. IV wedge face 102 on the cutter holder 1 until the cutter shaft holder 2 is in the clamped state in the cutter holder 1.

[0046] The disassembly process of the above hob cutter system is the inverse of the above mounting process: when the cutter system is disassembled, the screw rod

501 in the cutter locking device 5 is firstly screwed such that the inclined face on the sliding block 502 and the No. V wedge face 1-3 on the cutter holder 1 are separated from each other until the sliding block 502 is in a state of retracting into the cutter shaft holder 2; and then the cutter shaft holder 2 is rotated to loosen the fitting with the cutter holder 1, and the assembly of the cutter shaft holder 2 and the hob is taken out.

[0047] As shown in the figures, in Embodiment 3, a new-type easily replaceable hob cutter system is provided. One end of the screw rod 501 of the locking mechanism 5 is connected to the sliding block 502, and the other end thereof is connected to the cutter holder 1. The cutter holder 1 is provided with a cutter holder sliding channel 1-3, the cutter shaft holder 2 is provided with a cutter shaft fixture slot 2a-3, and the lower portion of the cutter holder sliding channel 1-3 abuts with the upper portion of the cutter shaft fixture slot 2a-3; and the sliding block 502 is arranged in the cutter holder sliding channel 1-3. The sliding block 502 of the locking device 5 extends out and is clamped into the cutter shaft fixture slot 2a-3 on the cutter shaft holder 2 to prevent rotation of the cutter shaft. The upper end of the screw rod 501 is provided with a fixture panel, and the screw rod is screwed by means of the end effector of the robot, which facilitates the automatic mounting and disassembly of the cutter system. The other structure is the same as that in Embodiment 2.

[0048] Further, the lower end of the screw rod 501 is a spherical face, a conical face or a cylindrical face, and the lower end of the screw rod 501 extends into the sliding block 502; and the screw rod 501 is in threaded connection with the cutter holder 1. The lower end of the screw rod 501 is clamped in the sliding block, and the sliding block 502 can be driven to slide upwards or downwards in the cutter holder sliding channel 1-3. When in operation, the screw rod 501 on the locking device 5 fits with the sliding block 502 through the bottom rotation face such as a spherical face, a conical face, a cylindrical face, etc., and the sliding block 502 is mounted in the cutter holder sliding channel 1-3 on the cutter holder 1 so as to be able to move in the cutter holder sliding channel 1-3; and the sliding block 502 is clamped into the cutter shaft fixture slot 2a-3 on the cutter shaft holder 2 so as to prevent axial rotation of the cutter shaft holder 2.

[0049] Further, both ends of the cutter shaft holder 2 are provided with a protruding block II 2a-4, with the outer surface of the protruding block II 2a-4 being a first wedge face 2a-1, and the upper surface of the protruding block II 2a-4 being a second wedge face 2a-2. The cutter holder 1 is a cylinder, the inner wall of the cutter holder 1 is provided with a second convex ring 1-4 and a second limiting block 1-5, and a second limiting sliding channel 1-6 is formed between the second convex ring 1-4 and the second limiting block 1-5; and after being mounted in the cutter holder, the cutter shaft holder can slide in the limiting sliding channel, supported by the second convex ring 1-4. The bottom face of the second limiting sliding

channel 1-6 is a third wedge face 1-1, and the upper side face of the second limiting sliding channel 1-6 is a fourth wedge face 1-2; and the third wedge face 1-1 fits with the first wedge face 2a-1, and the fourth wedge face 1-2 fits with the second wedge face 2a-2.

[0050] Further, the side face of the cutter shaft fixture slot 2a-3 is a fifth wedge face 2a-5, one side face of the sliding block 502 is a sixth wedge face 505, and the fifth wedge face 2a-5 fits with the sixth wedge face 505. As the sliding block 502 slides downwards, the sliding block is clamped tighter in the cutter shaft fixture slot 2a-3.

[0051] The mounting method for the above-mentioned new-type easily replaceable hob cutter system comprises the steps as follows: 1) mounting of the hob, in which the cutter shaft holder 2 with the hob is firstly loaded into the cutter holder 1, and the cutter shaft holder 2 is rotated when reaching a limit position, until the cutter shaft holder 2 is in a clamped state in the cutter holder 1; and 2) locking of the locking mechanism 5, in which the screw rod 501 on the locking mechanism 5 is rotated such that the sliding block 502 moves downwards and is clamped into the cutter shaft fixture slot 2a-3 on the cutter shaft holder 2, such that the cutter shaft holder 2 and the cutter holder 1 are always in a close-fit state.

[0052] In the step 1) when the cutter shaft holder 2 is in the clamped state in the cutter holder 1, the first wedge face 2a-1 on the cutter shaft holder 2 fits with the third wedge face 1-1 on the cutter holder 1, and the second wedge face 2a-2 on the cutter shaft holder 2 fits with the fourth wedge face 1-2 on the cutter holder 1 until the cutter shaft holder 2 is in the clamped state in the cutter holder 1.

[0053] The disassembly process of the hob cutter system is the inverse of the above mounting process: that is, the screw rod 501 in the cutter locking device 5 is firstly screwed such that the inclined face on the sliding block 502 and the inclined face on the cutter shaft fixture slot 2a-3 are separated from each other; and then the cutter shaft holder 2 is rotated to loosen the fitting with the cutter holder 1, and the assembly of the cutter shaft holder 2 and the hob is taken out.

[0054] As shown in the figures, in Embodiment 4, a new-type easily replaceable hob cutter system is provided. The locking mechanism 5 is a screw panel and sliding block mechanism. The screw panel and sliding block mechanism comprises a fixture block 801, a horizontal sliding block is provided and fits with the fixture block 801 in a sliding manner, a fixture panel 804 is provided on the horizontal sliding block, and the bottom face of the fixture panel 804 is provided with a thread and fits with the thread on the horizontal sliding block. The fixture panel is rotated to push the horizontal sliding block to horizontally move so as to achieve the locking function of the cutter shaft holder in the cutter holder 1 by means of the sliding block. The cutter system of the present invention fits with the end effector of the cutter replacement robot. A rotating shaft 803 is provided in the middle of the fixture panel 804, the fixture panel rotates relative to the rotating

shaft, and the fixture panel 804 is provided with a fixture plate 806. The fixture plate 806 comprises a No. III fixture plate 8011 and a No. IV fixture plate 8012, which respectively fit with the No. I fixture plate and the No. II fixture plate on the end effector to provide a clamping position for the end effector. The other structure is the same as that in Embodiment 3.

[0055] Further, the fixture block 801 is provided with a No. I sliding channel 807 and a No. II sliding channel 808, the No. I sliding channel 807 and the No. II sliding channel 808 are arranged symmetrically, the horizontal sliding block comprises a No. I sliding block panel 802 and a No. II sliding block 805, the No. I sliding block 802 fits with the No. I sliding channel 807, and the No. II sliding block 805 fits with the No. II sliding channel 808; and the fixture panel 804 fits with the No. I sliding block 802 and the No. II sliding block 805 in a threaded manner. The fixture panel is rotated to drive the No. I sliding block 802 to slide in the No. I sliding channel 807 and drive the No. II sliding block 805 to slide in the No. II sliding channel 808, such that the No. I sliding block panel 802 and the No. II sliding block 805 extends into the clamping slot 706 on the inner wall of the cutter holder 1 to lock the cutter shaft holder 2.

[0056] Further, the lower portion of the fixture block 801 is provided with a fixture leg 809, and the fixture leg 809 is provided with a No. G wedge face 8011; and the outer side of the sliding block is provided with a clamping block 8010, the outer side of the clamping block 8010 is provided with a No. H wedge face 8051, and the clamping block 8010 fits with the clamping slot 706.

[0057] Further, the cutter holder is 1 a cylinder, the inner wall of the cutter holder 1 is provided with a third convex ring 709 and a third limiting block 708, and a third limiting sliding channel 707 is formed between the third convex ring 709 and the third limiting block 708. After being loaded in the cutter holder, the cutter shaft holder slides in the third limiting sliding channel 707, supported by the third convex ring 709. When in use, the third limiting block 708 locks the cutter shaft holder in the cutter cylinder to prevent movement and rotation of the locking mechanism.

[0058] Further, one side of the third limiting block 708 is connected to the cutter holder 1, and the other side thereof is provided with a weight reduction recess 705; the inner wall of the cutter holder 1 is further provided with a clamping slot 706, the upper side face of the clamping slot 706 is a No. F wedge face 703, the No. F wedge face 703 fits with the No. H wedge face 8051, and the clamping block 8010 of the sliding block extends into the clamping slot 706 to lock the fixture block 801; the bottom face of the third limiting sliding channel 707 is a No. E wedge face 702, and the upper side face of the third limiting sliding channel 707 is a No. D wedge face 701; and after being loaded in the cutter holder, the cutter slides in the third limiting sliding channel 707, supported by the third convex ring 709.

[0059] Further, the cutter shaft holder 2 is provided with

a protruding block III 6024, on opposite sides, the side face of the protruding block III 6024 is a No. A wedge face 6021, the upper portion of the protruding block III is a No. B wedge face 6022, and the other two sides of the cutter shaft holder 2 are provided with a No. C wedge face 6023. The No. A wedge face 6021 fits with the No. E wedge face 702, the No. B wedge face 6022 fits with the No. D wedge face 701, and the No. C wedge face 6023 fits with the No. G wedge face 8011.

[0060] The mounting method for the above-mentioned new-type easily replaceable hob cutter system comprises the steps as follows: 1) mounting of the cutter, in which the cutter shaft holder 2 with the hob is firstly loaded into the cutter holder 1, and the cutter shaft holder 2 is rotated when reaching a limit position, until the cutter shaft holder 2 is in a clamped state in the cutter holder 1; 2) locking of the locking mechanism 5, in which after the cutter shaft holder 2 is mounted, the locking mechanism 5 is loaded into the cutter holder 1, such that the locking mechanism 5 locks the cutter shaft holder 2 to prevent the cutter shaft holder 2 from loosening; and 3) clamping of the cutter shaft holder 2, in which after the locking mechanism 5 is mounted, the locking mechanism 5 is locked by means of rotating the fixture panel 804 such that the cutter shaft holder 2, the locking mechanism 5 and the cutter holder 1 are always in a close-fit state.

[0061] In the step 1) when the cutter shaft holder 2 is in the clamped state in the cutter holder 1, the No. A wedge face 6021 on the cutter shaft holder 2 and the No. E wedge face 702 on the cutter holder 1 are fitted in wedge face, and the No. B wedge face 6022 on the cutter shaft holder 2 and the No. D wedge face 701 on the cutter holder 1 are fitted in wedge face.

[0062] In the step 2), after the locking mechanism 5 is loaded into the cutter holder 1, the No. C wedge face 6023 on the cutter shaft holder 2 and the No. G wedge face 8011 on the fixture block 801 form a fitting face.

[0063] In the step 3), by means of rotating the fixture panel 804, the No. I sliding block 802 and the No. II sliding block 805 move along the sliding channel of the fixture block 801, such that the No. I sliding block 802 and the No. II sliding block 805 simultaneously extend out and are clamped into the clamping slot in the cutter holder 1, and as the rotating shaft 803 rotates, the No. H wedge face 8051 fits with the No. F wedge face 703 in the clamping slot until the locking mechanism 5 is locked.

[0064] The disassembly process of the cutter system of the present invention is the inverse of the mounting process: as shown in Figs. 12 to 15, when the hob is disassembled, the fixture panel 804 in the locking mechanism 4 is firstly screwed such that the No. I sliding block 802 and the No. II sliding block 805 simultaneously retract, and the locking mechanism is taken out; and then the cutter shaft holder is rotated to loosen the fitting with the cutter holder and take out the cutter.

[0065] The above descriptions are merely preferred embodiments of the present invention but not intended to limit the present invention, and any modifications,

equivalent replacements, improvements, etc. made with-
in the spirit and principle of the present invention should
be included within the scope of protection of the present
invention.

Claims

1. A new-type easily replaceable hob cutter system,
comprising a cutter holder (1) and a hob (4), the hob
(4) being connected to the cutter holder (1) by means
of a cutter shaft holder (2), wherein the cutter shaft
holder (2) is fixedly connected to the cutter holder
(1) by means of a telescopic tensioning mechanism
(3) or a locking mechanism (5). 5
2. The new-type easily replaceable hob cutter system
according to claim 1, wherein the inner wall of the
cutter holder (1) is symmetrically provided with a
mounting groove (6), with the upper top face of the
mounting groove (6) being an arc-shaped face. 10
3. The new-type easily replaceable hob cutter system
according to claim 2, wherein the cutter shaft holder
(2) comprises a fixed block (201) and a swing block
(202), the swing block (202) being located at the up-
per portion of the fixed block (201) and hinged with
the fixed block (201), and the hob (4) being connect-
ed to the fixed block (201); and the fixed block (201)
and the swing block (202) both fit with the mounting
groove (6), the upper surface of the swing block (202)
is an arc-shaped face, the arc-shaped face of the
swing block (202) fits with the arc-shaped face of the
mounting groove (6), and the inner side face of the
swing block (202) is provided with a connecting lug
(203). 15
4. The new-type easily replaceable hob cutter system
according to claim 3, wherein the telescopic tension-
ing mechanism (3) comprises a support frame (301),
a first lead screw (302) and a second lead screw
(303); one end of the first lead screw (302) is hinged
with the connecting lug (203), and the other end
thereof is in threaded connection with the support
frame (301); and one end of the second lead screw
(303) is hinged with the corresponding connecting
lug (203), and the other end thereof is in threaded
connection with the corresponding side of the sup-
port frame (301), with the thread direction of the first
lead screw (302) being opposite the thread direction
of the second lead screw (303). 20
5. The new-type easily replaceable hob cutter system
according to claim 1 or 2, wherein the locking mech-
anism (5) is a screw rod and sliding block mechanism
comprising a screw rod (501) and a sliding block
(502), with one end of the screw rod (501) being con-
nected to the sliding block (502), and the other end 25

thereof being connected to the cutter shaft holder (2)
or the cutter holder (1).

6. The new-type easily replaceable hob cutter system
according to claim 5, wherein the cutter holder (1) is
provided with a first limiting block (105), and the outer
side of the first limiting block (105) is provided with
a No. V wedge face (103); the cutter shaft holder (2)
is provided with a cutter shaft sliding channel (2-3),
and the sliding block (502) is arranged in the cutter
shaft sliding channel (2-3); and the sliding block
(502) is provided with a No. VI wedge face (503),
and the No. VI wedge face (503) fits with the No. V
wedge face (103). 30
7. The new-type easily replaceable hob cutter system
according to claim 6, wherein the upper portion of
the sliding block (502) is provided with a cylindrical
channel (504), the upper end of the screw rod (501)
passes through the sliding block (502) and then ex-
tends into the cylindrical channel (504), and the
screw rod (501) is in threaded connection with the
sliding block (502); and the lower end of the screw
rod (501) is a spherical face, a conical face or a cy-
lindrical face, and the lower end of the screw rod
(501) is connected to the cutter shaft holder (2). 35
8. The new-type easily replaceable hob cutter system
according to claim 6 or 7, wherein both ends of the
cutter shaft holder (2) are provided with a protruding
block I (2-4), with the outer surface of the protruding
block I (2-4) being a No. I wedge face (2-1), and the
upper surface of protruding block I (2-4) being a No.
II wedge face (2-2). 40
9. The new-type easily replaceable hob cutter system
according to claim 7, wherein the cutter holder (1) is
a cylinder, the inner wall of the cutter holder (1) is
provided with a first convex ring (104), and a limiting
sliding channel (106) is formed between the first con-
vex ring (104) and the first limiting block (105); the
bottom face of the limiting sliding channel (106) is a
No. III wedge face (101), and the upper side face of
the limiting sliding channel (106) is a No. IV wedge
face (102); and the No. III wedge face (101) fits with
the No. I wedge face (2-1), and the No. IV wedge
face (102) fits with the No. II wedge face (2-2). 45
10. The new-type easily replaceable hob cutter system
according to claim 5, wherein the cutter holder (1) is
provided with a cutter holder sliding channel (1-3),
the cutter shaft holder (2) is provided with a cutter
shaft fixture slot (2a-3), and the lower portion of the
cutter holder sliding channel (1-3) abuts with the up-
per portion of the cutter shaft fixture slot (2a-3); and
the sliding block (502) is arranged in the cutter holder
sliding channel (1-3). 50

11. The new-type easily replaceable hob cutter system according to claim 10, wherein the lower end of the screw rod (501) is a spherical face, a conical face or a cylindrical face, and the lower end of the screw rod (501) extends into the sliding block (502); and the screw rod (501) is in threaded connection with the cutter holder (1).
12. The new-type easily replaceable hob cutter system according to claim 11, wherein both ends of the cutter shaft holder (2) are provided with a protruding block II (2a-4), with the outer surface of the protruding block II (2a-4) being a first wedge face (2a-1), and the upper surface of the protruding block II (2a-4) being a second wedge face (2a-2).
13. The new-type easily replaceable hob cutter system according to claim 12, wherein the cutter holder (1) is a cylinder, the inner wall of the cutter holder (1) is provided with a second convex ring (1-4) and a second limiting block (1-5), and a second limiting sliding channel (1-6) is formed between the second convex ring (1-4) and the second limiting block (1-5); the bottom face of the second limiting sliding channel (1-6) is a third wedge face (1-1), and the upper side face of the second limiting sliding channel (1-6) is a fourth wedge face (1-2); and the third wedge face (1-1) fits with the first wedge face (2a-1), and the fourth wedge face (1-2) fits with the second wedge face (2a-2).
14. The new-type easily replaceable hob cutter system according to claim 12 or 13, wherein the side face of the cutter shaft fixture slot (2a-3) is a fifth wedge face (2a-5), one side face of the sliding block (502) is a sixth wedge face (505), and the fifth wedge face (2a-5) fits with the sixth wedge face (505).
15. The new-type easily replaceable hob cutter system according to claim 1 or 2, wherein the locking mechanism (5) is a screw panel and sliding block mechanism comprising a fixture block (801), a horizontal sliding block is provided and fits with the fixture block (801) in a sliding manner, a fixture panel (804) is provided on the horizontal sliding block, the middle of the fixture panel (804) is provided with a rotating shaft (803), and a fixture plate (806) is provided on the fixture panel (804).
16. The new-type easily replaceable hob cutter system according to claim 15, wherein the fixture block (801) is provided with a No. I sliding channel (807) and a No. II sliding channel (808), the No. I sliding channel (807) and the No. II sliding channel (808) are arranged symmetrically, the horizontal sliding block comprises a No. I sliding block panel (802) and a No. II sliding block (805), the No. I sliding block (802) fits with the No. I sliding channel (807), and the No. II sliding block (805) fits with the No. II sliding channel (808); and the fixture panel (804) fits with the No. I sliding block (802) and the No. II sliding block (805) in a threaded manner.
17. The new-type easily replaceable hob cutter system according to claim 16, wherein the lower portion of the fixture block (801) is provided with a fixture leg (809), and the fixture leg (809) is provided with a No. G wedge face (8011); and the outer side of the sliding block is provided with a clamping block (8010), and the outer side of the clamping block (8010) is provided with a No. H wedge face (8051).
18. The new-type easily replaceable hob cutter system according to claim 16 or 17, wherein the cutter holder is a cylinder, the inner wall of the cutter holder (1) is provided with a third convex ring (709) and a third limiting block (708), and a third limiting sliding channel (707) is formed between the third convex ring (709) and the third limiting block (708).
19. The new-type easily replaceable hob cutter system according to claim 18, wherein one side of the third limiting block (708) is connected to the cutter holder (1), and the other side thereof is provided with a weight reduction recess (705); the inner wall of the cutter holder (1) is further provided with a clamping slot (706), the upper side face of the clamping slot (706) is a No. F wedge face (703), and the No. F wedge face (703) fits with the No. H wedge face (8051); the bottom face of the third limiting sliding channel (707) is a No. E wedge face (702), and the upper side face of the third limiting sliding channel (707) is a No. D wedge face (701); and after being loaded in the cutter holder, the cutter slides in the third limiting sliding channel (707), supported by the third convex ring (709).
20. The new-type easily replaceable hob cutter system according to claim 19, wherein the cutter shaft holder (2) is provided with a protruding block III (6024) on opposite sides, the side face of the protruding block III (6024) is a No. A wedge face (6021), the upper portion of the protruding block III is a No. B wedge face (6022), and the other two sides of the cutter shaft holder (2) are provided with a No. C wedge face (6023).
21. A mounting method for the new-type easily replaceable hob cutter system of claim 4, comprising the steps as follows: in S1, the hob (4) is firstly mounted on the fixed block (201) of the cutter shaft holder (2) to form a hob and cutter shaft holder assembly; in S2, the hob and cutter shaft holder assembly is then loaded as a whole into the cutter holder (1); and in S3, finally, the swing block (202) of the cutter shaft holder (2) is driven by the telescopic tensioning

mechanism (3) to axially swing, such that the cutter shaft holder (2) is pushed against the cutter holder (1), thereby completing the mounting of the cutter.

22. A mounting method for the new-type easily replaceable hob cutter system of claim 9, comprising the steps as follows: 1) mounting of the hob, in which the cutter shaft holder (2) with the hob is firstly loaded into the cutter holder (1), and the cutter shaft holder (2) is rotated when reaching a limit position, until the cutter shaft holder (2) is in a clamped state in the cutter holder (1); and 2) locking of the locking mechanism (5), in which the screw rod (501) on the locking mechanism (5) is rotated such that the sliding block (502) moves in the cutter shaft sliding channel (2-3) on the cutter shaft holder (2), and when extending out and reaching the limit position, the sliding block (502) abuts against the No. V wedge face (303) on the cutter holder (1), such that the cutter shaft holder (2) and the cutter holder (1) are in a close-fit state.
23. The mounting method for a new-type easily replaceable hob cutter system according to claim 22, wherein in the step 1), when the cutter shaft holder (2) is in the clamped state in the cutter holder (1), the No. I wedge face (2-1) on the cutter shaft holder (2) fits with the No. III wedge face (101) on the cutter holder (1), and the No. II wedge face (2-2) on the cutter shaft holder (2) fits with the No. IV wedge face (102) on the cutter holder (1) until the cutter shaft holder (2) is in the clamped state in the cutter holder (1).
24. A mounting method for the new-type easily replaceable hob cutter system of claim 14, comprising the steps as follows: 1) mounting of the hob, in which the cutter shaft holder (2) with the hob is firstly loaded into the cutter holder (1), and the cutter shaft holder (2) is rotated when reaching a limit position, until the cutter shaft holder (2) is in a clamped state in the cutter holder (1); and 2) locking of the locking mechanism (5), in which the screw rod (501) on the locking mechanism (5) is rotated such that the sliding block (502) moves downwards and is clamped into the cutter shaft fixture slot (2a-3) on the cutter shaft holder (2), such that the cutter shaft holder (2) and the cutter holder (1) are always in a close-fit state.
25. The mounting method for a new-type easily replaceable hob cutter system according to claim 24, wherein in the step 1), when the cutter shaft holder (2) is in the clamped state in the cutter holder (1), the first wedge face (2a-1) on the cutter shaft holder (2) fits with the third wedge face (1-1) on the cutter holder (1), and the second wedge face (2a-2) on the cutter shaft holder (2) fits with the fourth wedge face (1-2) on the cutter holder (1) until the cutter shaft holder (2) is in the clamped state in the cutter holder (1).

26. A mounting method for the new-type easily replaceable hob cutter system of claim 19 or 20, comprising the steps as follows: 1) mounting of the cutter, in which the cutter shaft holder (2) with the hob is firstly loaded into the cutter holder (1), and the cutter shaft holder (2) is rotated when reaching a limit position, until the cutter shaft holder (2) is in a clamped state in the cutter holder (1); 2) locking of the locking mechanism (5), in which after the cutter shaft holder (2) is mounted, the locking mechanism (5) is loaded into the cutter holder (1), such that the locking mechanism (5) locks the cutter shaft holder (2) to prevent the cutter shaft holder (2) from loosening; and 3) clamping of the cutter shaft holder (2), in which after the locking mechanism (5) is mounted, the locking mechanism (5) is locked by means of rotating the fixture panel (804) such that the cutter shaft holder (2), the locking mechanism (5) and the cutter holder (1) are always in a close-fit state.
27. The mounting method for a new-type easily replaceable hob cutter system according to claim 26, wherein in the step 1), when the cutter shaft holder (2) is in the clamped state in the cutter holder (1), the No. A wedge face (6021) on the cutter shaft holder (2) and the No. E wedge face (702) on the cutter holder (1) are fitted in wedge face, and the No. B wedge face (6022) on the cutter shaft holder (2) and the No. D wedge face (701) on the cutter holder (1) are fitted in wedge face.
28. The mounting method for a new-type easily replaceable hob cutter system according to claim 26, wherein in the step 2), after the locking mechanism (5) is loaded into the cutter holder (1), the No. C wedge face (6023) on the cutter shaft holder (2) and the No. G wedge face (8011) on the fixture block (801) form a fitting face.
29. The mounting method for a new-type easily replaceable hob cutter system according to claim 26, wherein in the step 3), by means of rotating the fixture panel (804), the No. I sliding block (802) and the No. II sliding block (805) move along the sliding channel of the fixture block (801), such that the No. I sliding block (802) and the No. II sliding block (805) simultaneously extend out and are clamped into the clamping slot in the cutter holder (1), and as the rotating shaft (803) rotates, the No. H wedge face (8051) fits with the No. F wedge face (703) in the clamping slot until the locking mechanism (5) is locked.

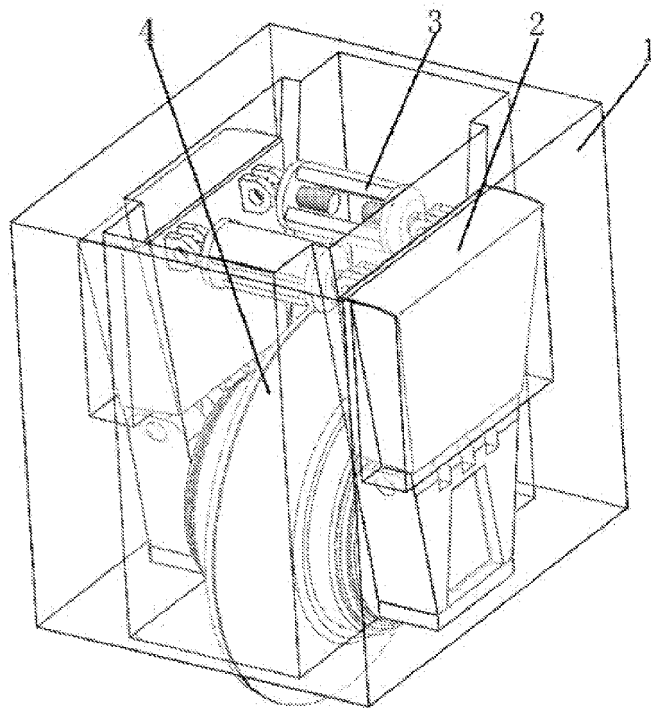


FIG. 1

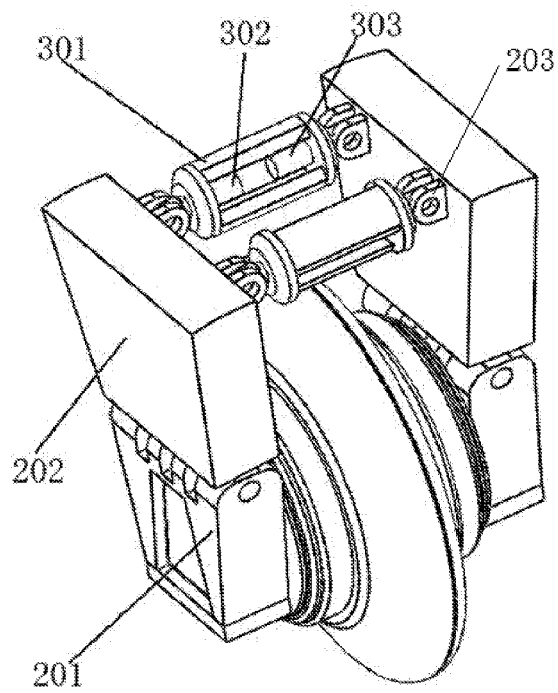


FIG. 2

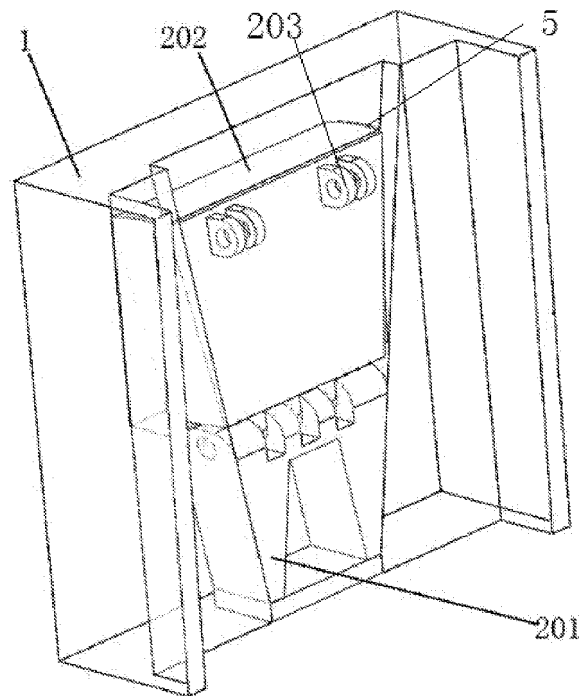


FIG. 3

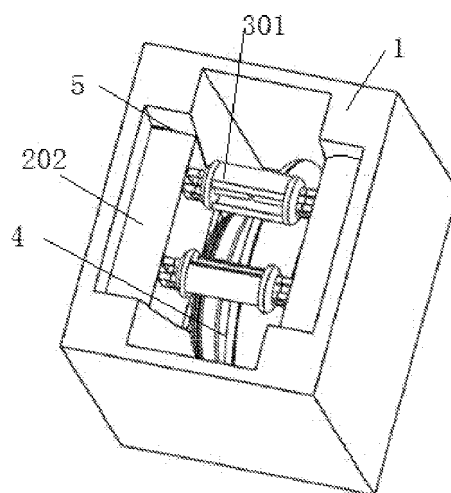


FIG. 4

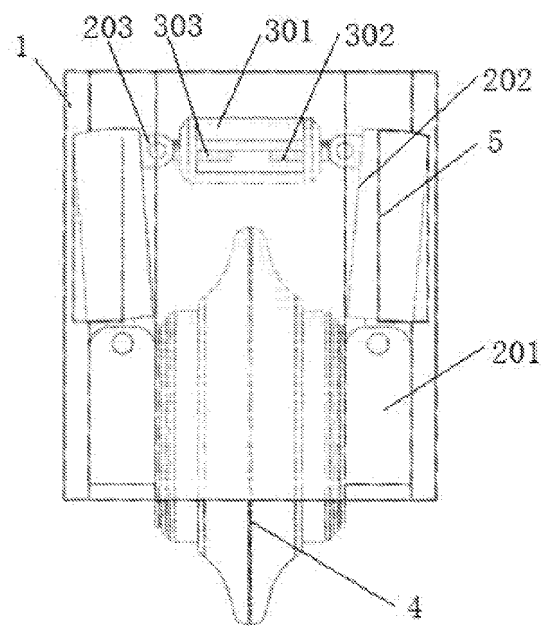


FIG. 5

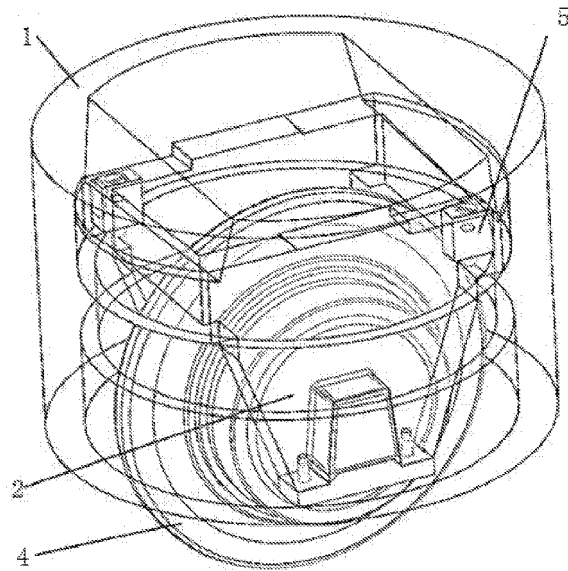


FIG. 6

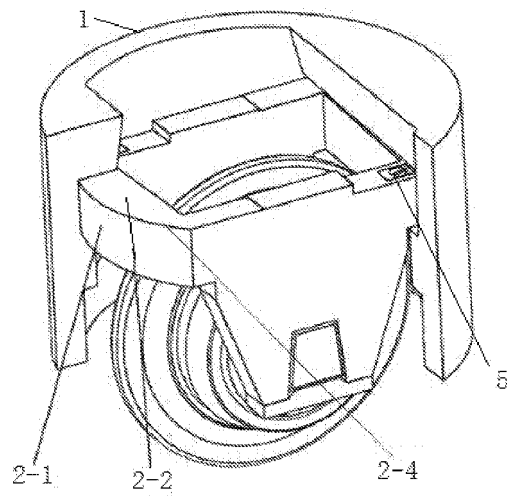


FIG. 7

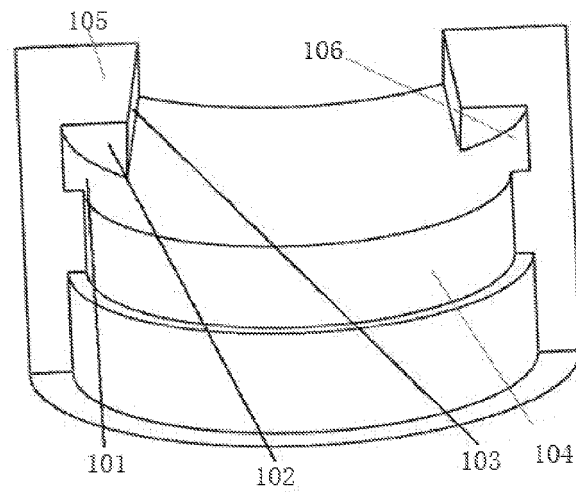


FIG. 8

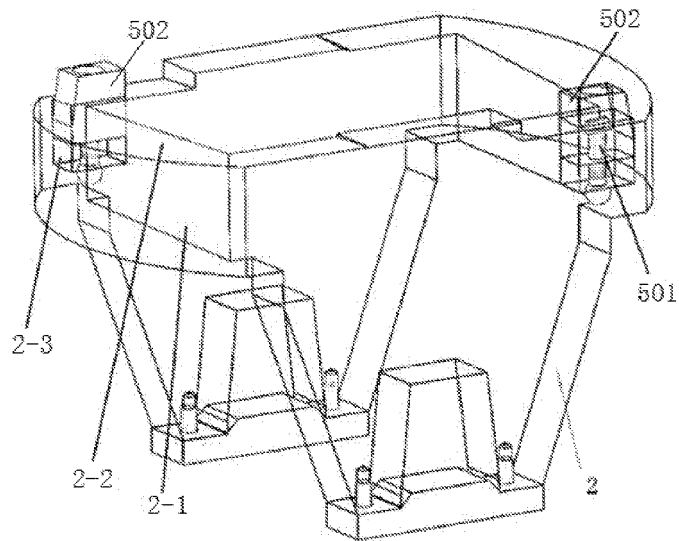


FIG. 9

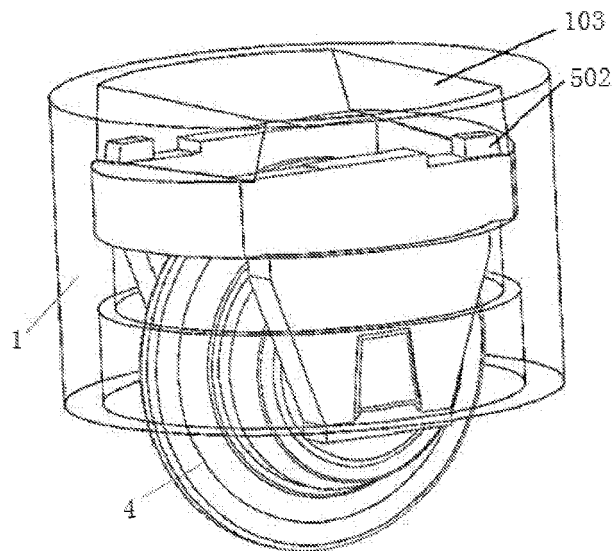


FIG. 10

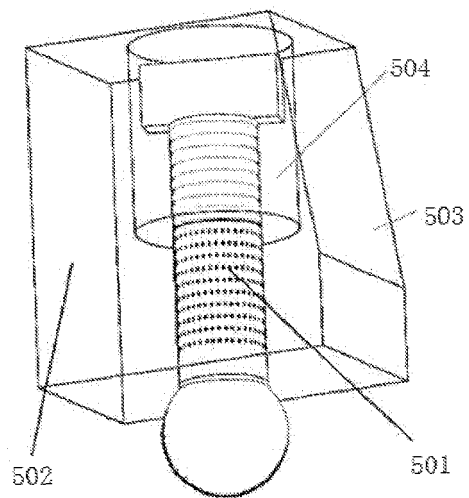


FIG. 11

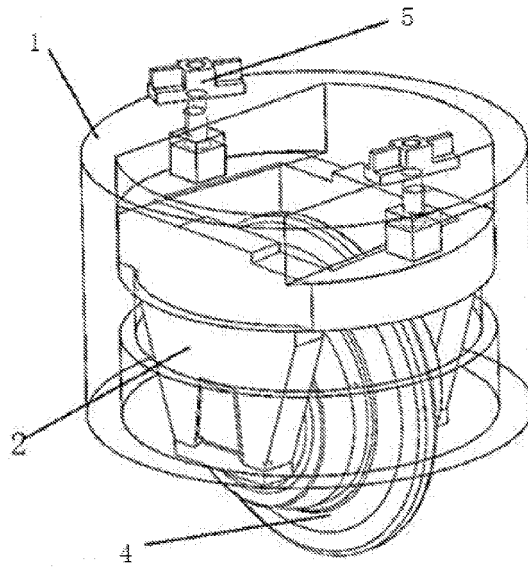


FIG. 12

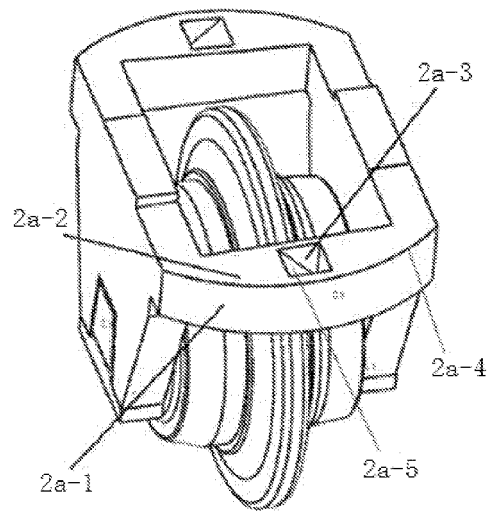


FIG. 13

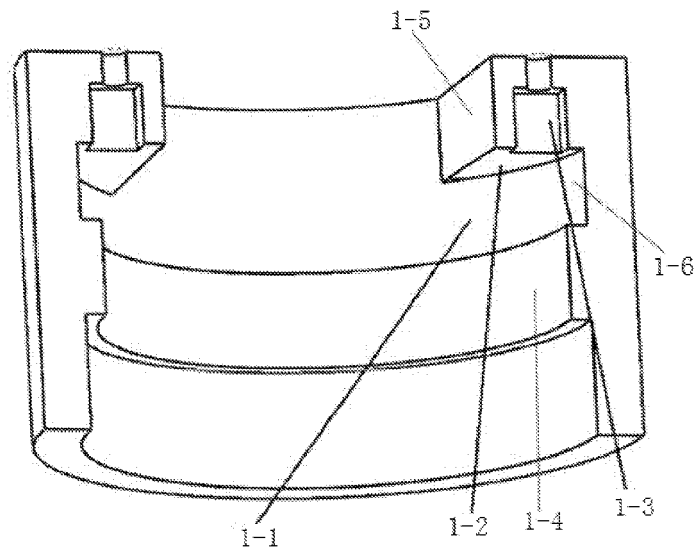


FIG. 14

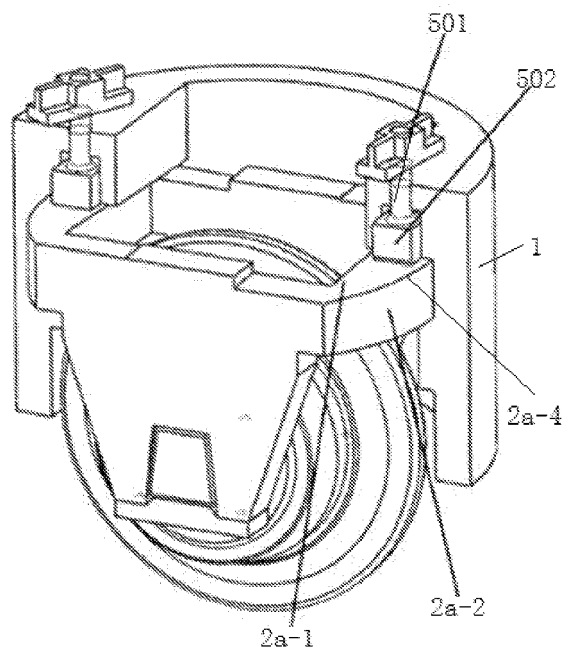


FIG. 15

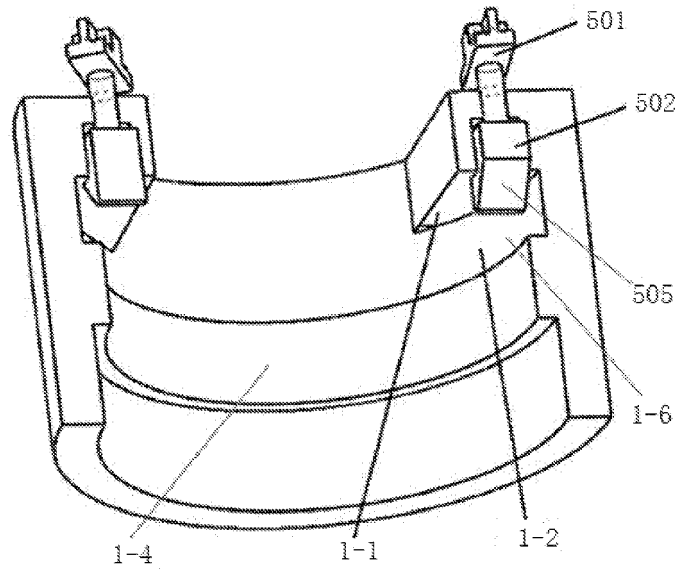


FIG. 16

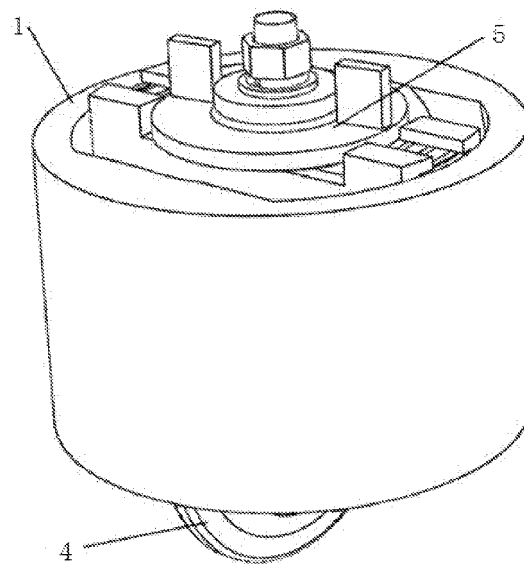


FIG. 17

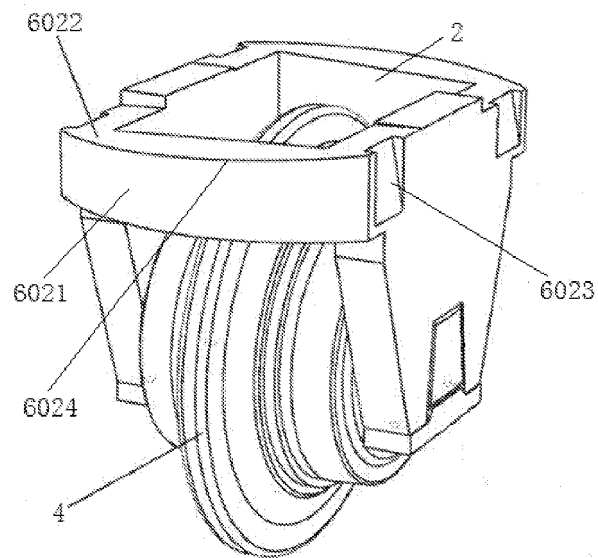


FIG. 18

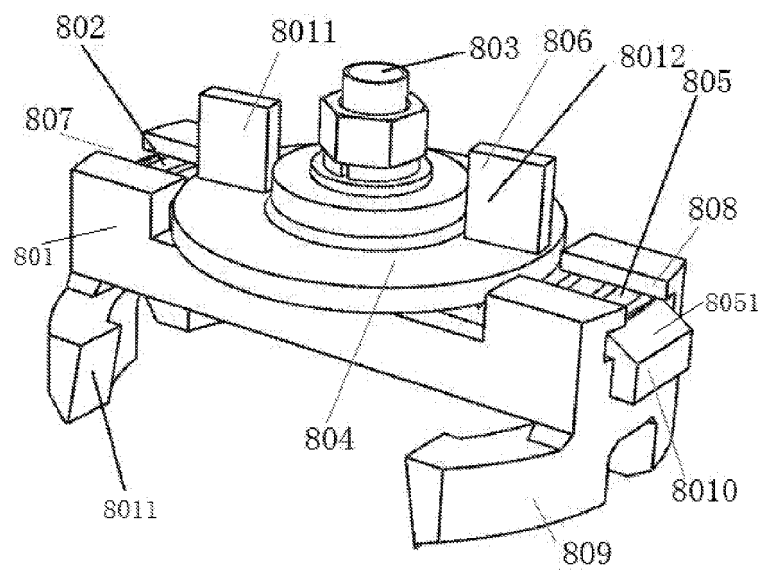


FIG. 19

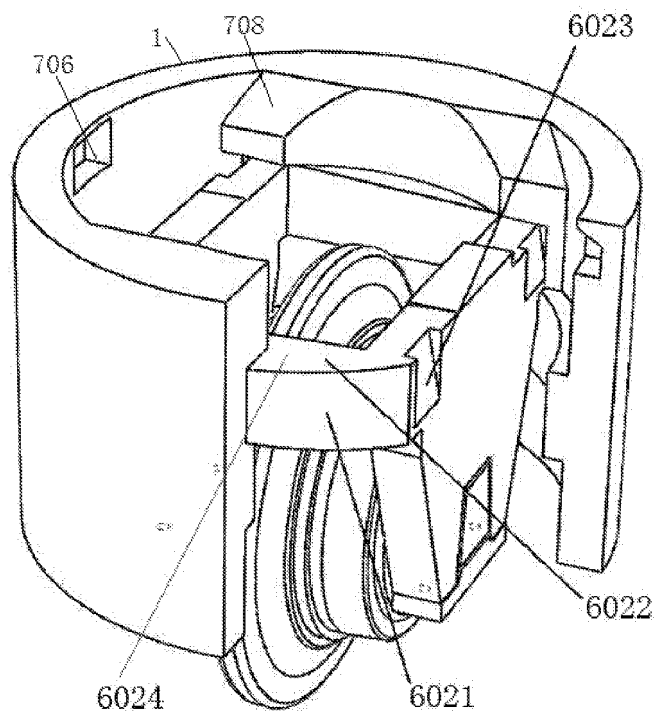


FIG. 20

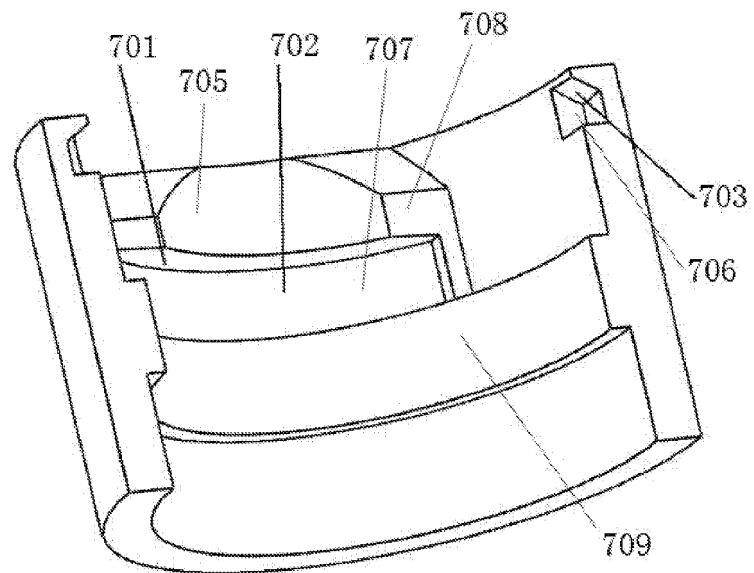


FIG. 21

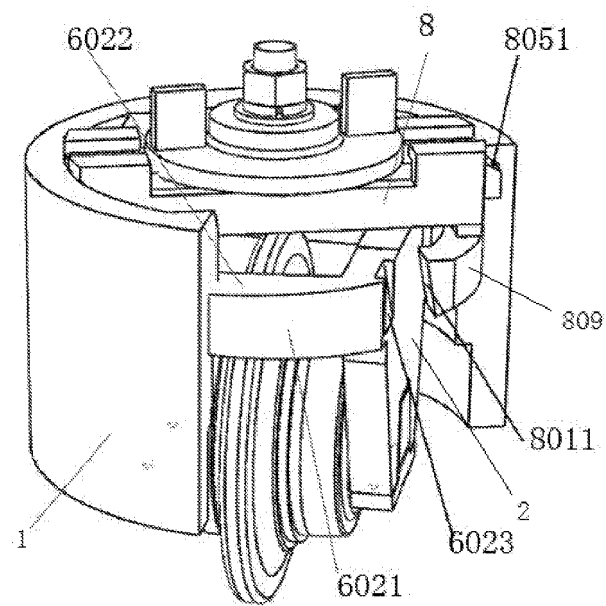


FIG. 22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/079640

A. CLASSIFICATION OF SUBJECT MATTER

E21D 9/087(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)

E21D

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

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

CNPAT, CNKI, EPODOC, WPI, 滚刀, 更换, 锁紧, 刀座, 张紧, 凹槽, 螺纹, 滑块, roll, cutter, shaft, seat, lock, screw, groove, screw, slide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109915161 A (CHINA RAILWAY ENGINEERING EQUIPMENT GROUP CO., LTD.) 21 June 2019 (2019-06-21) claims 1-10, description, pages 2 and 3, and figures 1-9	1-29
PX	CN 209818066 U (CHINA RAILWAY ENGINEERING EQUIPMENT GROUP CO., LTD.) 20 December 2019 (2019-12-20) claims 1-10, description, pages 2 and 3, and figures 1-9	1-29
PX	CN 109944602 A (CHINA RAILWAY ENGINEERING EQUIPMENT GROUP CO., LTD.) 28 June 2019 (2019-06-28) claims 1-10, description, pages 2 and 3, and figures 1-8	1, 2
PX	CN 209855801 U (CHINA RAILWAY ENGINEERING EQUIPMENT GROUP CO., LTD.) 27 December 2019 (2019-12-27) claims 1-10, description, pages 2 and 3, and figures 1-8	1, 2
PX	CN 109944601 A (CHINA RAILWAY ENGINEERING EQUIPMENT GROUP CO., LTD.) 28 June 2019 (2019-06-28) claims 1-10, description, pages 3 and 4, and figures 1-15	1, 2



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

“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

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

13 April 2020

Date of mailing of the international search report

23 April 2020

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing
100088
China

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/079640

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/079640

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