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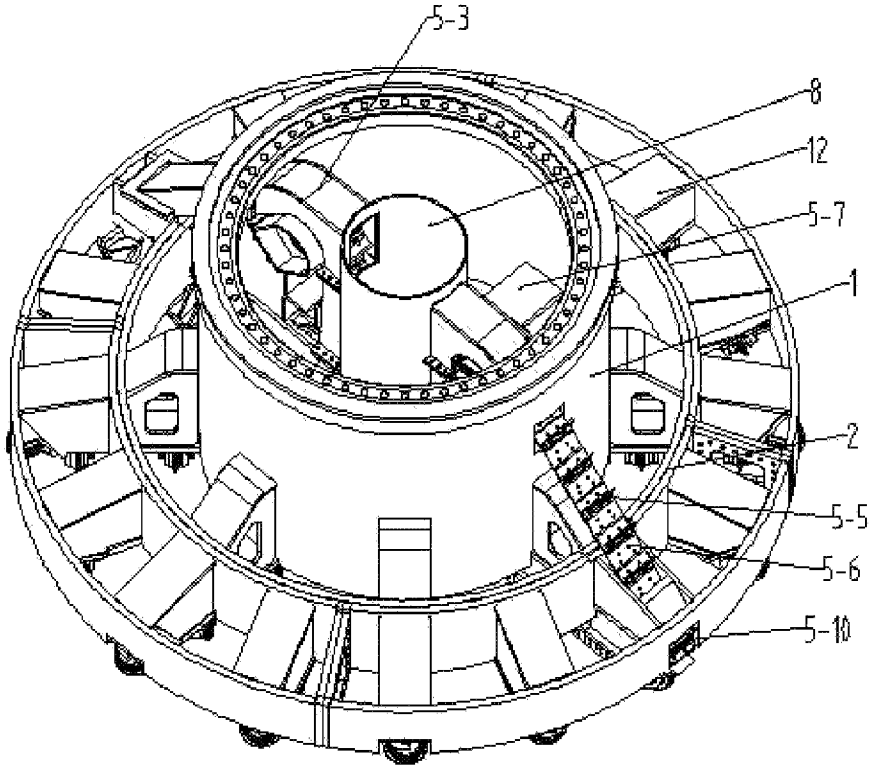

图 1

(57) Abrégé/Abstract:
Disclosed is a cutter disk for vertical shaft sinking, comprising a central block (1), side blocks (2), and a slag discharging mechanism (5), wherein the side blocks are evenly mounted on the outer wall of the lower part of the central block in the

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(57) Abrégé(suite)/Abstract(continued):
circumferential direction, the bottom part of the central block is a tapered surface, and several central blades (11) are provided on the tapered surface; the bottom part of the side block is provided with several face blades (3) and several side blades (4), the face blades are arranged on the bottom surface of the side block in the radial direction, and the side blades are arranged at the outer edge of the bottom part of the side block; the upper portion of the slag discharging mechanism is connected to the central block, and the lower part of the slag discharging mechanism is connected to the side block and projects from the bottom surface of the side block; and the interior of the central block is provided with a temporary slag barrel (8), and the temporary slag barrel is in communication with the slag discharging mechanism. The functions of slag blocking, slag collecting, slag conveying, and surface excavation are integrated into the cutter disk. Local bulging of the excavation surface is cleared while efficient slag removal is ensured so as to better protect the blades and slag scrapers, such that the excavation effect is improved, and the work efficiency is also improved.

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(54) **Title:** CUTTER DISK FOR VERTICAL SHAFT SINKING

(54) 发明名称: 一种竖井掘进刀盘

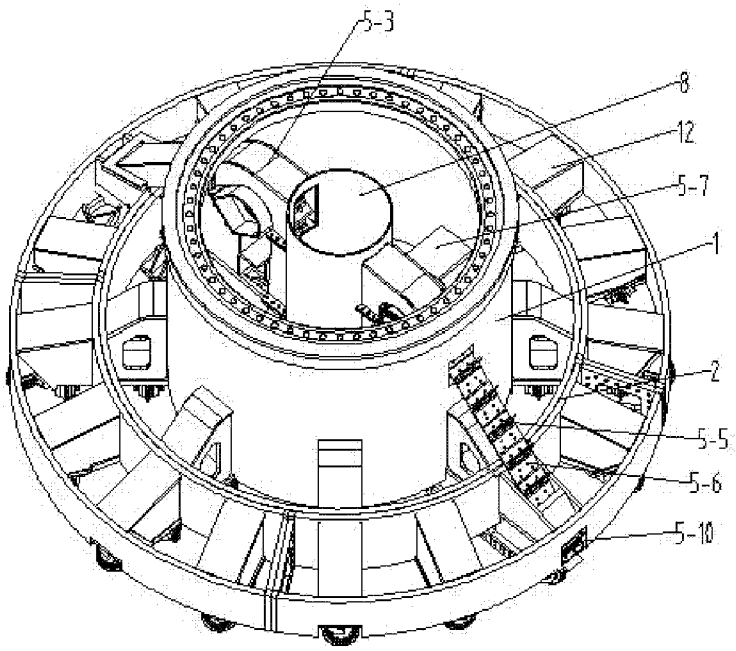

图 1

(57) **Abstract:** Disclosed is a cutter disk for vertical shaft sinking, comprising a central block (1), side blocks (2), and a slag discharging mechanism (5), wherein the side blocks are evenly mounted on the outer wall of the lower part of the central block in the circumferential direction, the bottom part of the central block is a tapered surface, and several central blades (11) are provided on the tapered surface; the bottom part of the side block is provided with several face blades (3) and several side blades (4), the face blades are arranged on the bottom surface of the side block in the radial direction, and the side blades are arranged at the outer edge of the bottom part of the side

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(81) 指定国(除另有指明，要求每一种可提供的国家保护)：AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

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block; the upper portion of the slag discharging mechanism is connected to the central block, and the lower part of the slag discharging mechanism is connected to the side block and projects from the bottom surface of the side block; and the interior of the central block is provided with a temporary slag barrel (8), and the temporary slag barrel is in communication with the slag discharging mechanism. The functions of slag blocking, slag collecting, slag conveying, and surface excavation are integrated into the cutter disk. Local bulging of the excavation surface is cleared while efficient slag removal is ensured so as to better protect the blades and slag scrapers, such that the excavation effect is improved, and the work efficiency is also improved.

(57) 摘要：一种竖井掘进刀盘，包括中心块（1）、边块（2）和排渣机构（5），边块沿周向均匀安装在中心块下部的外壁上，中心块的底部为锥形面，锥形面上设有若干中心刀（11）；边块的底部设有若干面刀（3）和若干边刀（4），面刀沿径向方向设置在边块的底面上，边刀设置在边块底部的外边缘处；排渣机构的上部与中心块相连接，排渣机构的下部与边块相连接且伸出边块的底面；中心块的内部设有临时渣筒（8），临时渣筒与排渣机构相连通。该刀盘集挡渣、集渣、输渣和平面开挖于一体，在保证高效地将渣土清运的同时，清理开挖面的局部凸起，更好地保护刀具及出渣刮板，开挖掘进效果好，提高了工作效率。

CUTTERHEAD FOR VRETICAL SHAFT BORING

Field of the Invention

[0001] The invention generally relates to shaft boring equipment, more specifically to a cutterhead for shaft boring.

Description of the Prior Art

[0002] As the urban construction rapidly develops, more vertical shaft constructions are applied in reality, and the thrust system is an indispensable part in vertical shaft equipment. In the process of boring, existing boring equipment will frequently encounter large and hard rock formation or rocks; as the boring blades of the cutterhead of existing boring equipment are poorly arranged, large rocks will cause great impact on the cutterhead, which may lead to damage of the cutterhead. The extant cutterheads are structurally complicated, poor in integration and muck removal effect, and low in transport efficiency, which adversely prevents themselves from working underground for a long time. Therefore, it is necessary for us to develop a cutterhead that is efficient and good in muck removal effect.

Summary of the Invention

[0003] In terms of the shortcoming of the prior art, the invention provides a cutterhead for shaft boring, which solves the problems of poor muck removal effect and low work efficiency.

[0004] The technical scheme of the present invention is implemented in the following way. A cutterhead for shaft boring comprises a central block, side blocks, and muck discharge mechanisms, the central block is of tubular structure, the side blocks are evenly mounted on the outer wall of the lower part of the central block in the circumferential direction, the bottom part of the central block is a tapered surface, and several central blades are provided on the tapered surface, face blades and side blades are mounted on the bottoms of the side blocks, the face blades are arranged on the bottom surfaces of the side blocks in the radial direction, and the side blades are arranged at the outer edge of the bottoms of the side blocks; the upper portions of the muck discharge mechanisms are connected to the central block, and the lower portions of the muck discharge mechanisms are connected to the side blocks and project from the bottom surfaces of the side blocks; a temporary muck barrel is arranged inside the central block; and the temporary muck barrel is in communication with

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the muck discharge mechanisms.

[0005] Each muck discharge mechanism comprises a driving pulley and two guide pulleys, wherein the driving pulley is mounted inside the central block through a support cover and above the side blocks, one side of the support cover is connected with the temporary muck barrel, and the other side penetrates the central block to be connected with the side blocks; the two guide pulleys are mounted at the bottom of the side blocks, the driving pulley and the two guide pulleys are arranged within the same vertical surface and distributed in a manner of triangle, the guide pulleys are connected with the driving pulley through a muck scraping chain, the muck scraping chain penetrates the support cover and bypasses the guide pulleys and the driving pulley to form a closed annular triangle structure, muck scraping plates and muck discharge baffles are evenly arranged at intervals on the muck scraping chain.

[0006] The length of the muck scraping plates protruding out of the side blocks is not larger than that of the face blades and the side blades protruding out of the side blocks.

[0007] The bottoms of the side blocks are provided with rock breaking tapered plates and muck scraper blades in the radial direction, the rock breaking tapered plates are arranged on one side of the muck scraping chain, and the muck scraper blades are arranged on the other side of the muck scraping chain; the driving pulley is connected with a driving motor reduction gear mounted on one side of the interior of the central block; two guide pulleys are respectively connected with gripping gears mounted inside the side blocks and the central block.

[0008] One side of the support cover connected with the temporary muck barrel is provided with a muck loading, which corresponds to a muck inlet of the temporary muck barrel.

[0009] The temporary muck barrel is fixedly connected with the central block, the central axis of the temporary muck barrel is overlapped with that of the central block, and the wall of the temporary muck barrel is provided with a muck inlet corresponding to the muck discharge mechanism.

[0010] The outer walls of the side blocks are provided with chain grooves fit with the muck scraping chain, and the muck scraping chain penetrates the chain grooves into the support cover.

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[0011] Each of the face blades and the side blades comprises a holder and a tool, the tools are evenly mounted on the holders, the holders correspond to the tools one by one, the side blades are obliquely arranged at the outer edges of the side blocks.

[0012] The central block is connected with the side blocks through flanges, and the flanges are evenly arranged between the central block and the side blocks.

[0013] The muck discharge mechanisms rotate as the cutterhead revolves, and muck is conveyed to the temporary muck barrel during rotation.

[0014] The cutterhead forms an annular triangular muck conveying channel through the muck scraping chain bypassing the driving pulley and two guide pulleys, which is used for clearing and transporting muck under the cutterhead and collecting the muck into the temporary muck barrel. As muck conveying is done in the support cover all the time, conveying effect is good and conveying efficiency is improved. The bottoms of the side blocks are provided with the face blades, the side blades and rock breaking tapered plates, such that rock or soil can be cracked more efficiently, impact on the cutterhead from rock can be reduced, and service life of the cutterhead is prolonged. The cutterhead is integrated with muck stopping, collecting and conveying and excavation. Therefore, muck can be cleared and transported efficiently, local heaves on the excavation side can be removed, the tools and muck craping plates can be better protected, excavation and boring effect is good, and work efficiency is much increased.

Brief Description of the Drawings

[0015] Various embodiments of the present invention will become fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings. It should be noted that the drawings as follows just illustrated some embodiments of the present invention, those skilled of the art can obtain other drawings based on the following drawings without making any creative work.

[0016] Fig. 1 is an overall structural view of the present invention.

[0017] Fig. 2 is an axonometric view of the present invention.

[0018] Fig. 3 is a local enlarged view of Position A in Fig. 2 of the present invention.

[0019] Fig. 4 is an internal structure view of the present invention.

Description of the Preferred Embodiments

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[0020] The technical schemes of the embodiments will be clearly and fully described in conjunction with the drawings. Apparently, the described embodiments are not exhaustive. Based on the embodiments of the present invention, various embodiments obtained by those skilled of the art without making any creative work will definitely fall into the protection scope of the present invention.

[0021] As shown in Fig. 1-4, Embodiment 1, the cutterhead comprises a central block 1, side blocks 2, and several muck discharge mechanisms, the central block 1 is of tubular structure, the side blocks 2 are evenly mounted on the outer wall of the lower portion of the central block 1 in the circumferential direction, the central block 1 is connected with the side blocks 2 through flanges 12, and the flanges are uniformly arranged between the central block 1 and the side blocks 2; the bottom part of the central block 1 is a tapered surface, and several central blades 11 are provided on the tapered surface; the central blades are arranged at the bottom of the central block 1 in the number determined according to needs and used for intensively cracking rock formation or rocks in the middle of the shaft, which can reduce impacts on the face blades from the rock formation or rocks. Face blades 3 and side blades 4 are mounted on the bottoms of the side blocks 2 for cracking soil or rocks on the ground, the face blades 3 are uniformly arranged on the bottom surfaces of the side blocks 2 in the radial direction, the side blades 4 are uniformly arranged at the outer edges of the bottoms of the side blocks 2, the tools of the side blades extend out of the side blocks and are used for cracking soil or rock around the side blocks; the central blades 11, the face blades 3 and the side blades 4 are arranged on and cover the excavation side of the shaft; each of the central blades 11, the face blades 3, and the side blades 4 comprises a holder 3-1 and a tool 3-2, the tools 3-2 are uniformly mounted on the holders 3-1, the tools 3-2 correspond to the holders 3-1 one by one, and the side blades 4 are obliquely arranged at the outer edges of the side blocks 2. The upper portions of the muck discharge mechanisms 5 are connected with the central block 1, the lower portions of the muck discharge mechanisms 5 are connected with the side blocks 2 and extends out of their bottom surfaces, and the face blades 3 and the muck discharge mechanisms 5 are radially arranged by taking the circular centers of the side blocks as the center; the temporary muck barrel 8 is arranged inside the central block 1 and in communication with the muck discharge mechanisms 5, the central blades 11, the face

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blades 3, and the side blades 4 can break the soil or rocks, muck can be discharged into the temporary muck barrel through the muck discharge mechanisms, and the temporary muck barrel can temporarily store the muck.

[0022] Embodiment 2 discloses a cutterhead for shaft boring. Each muck discharge mechanism 5 comprises a driving pulley 5-1 and two guide pulleys 5-2, wherein the driving pulley 5-1 is mounted inside the central block 1 through a support cover 5-3 and above the side blocks 2, one side of the support cover 5-3 is connected with the temporary muck barrel 8, and the other side penetrates the central block 1 to be connected with the side blocks 2 for protecting the muck scraping chain 5-4; the two guide pulleys 5-2 are mounted at the bottom of the side blocks 2, one of the guide pulleys is close to the central block, and the other is close to the edges of the side blocks; the driving pulley 5-1 and the two guide pulleys 5-2 are arranged within the same vertical surface and distributed in a manner of triangle, the guide pulleys 5-2 are connected with the driving pulley 5-1 through the muck scraping chain 5-4, the muck scraping chain 5-4 penetrates the support cover 5-3 and bypasses the guide pulleys 5-2 and the driving pulley5-1 to form a closed annular triangle structure, and muck under the cutterhead is conveyed to the temporary muck barrel through the muck scraping chain, and muck scraping plates 5-5 and muck discharge baffles 5-6 are evenly arranged at intervals on the muck scraping chain 5-4. The muck scraping plates 5-5 are obliquely arranged, the muck discharge baffles 5-6 are parallel to the muck scraping chain, which are convenient for shoveling and transporting the muck. The length of the muck scraping plates 5-5 extending out of the side blocks 2 is not larger than that of the length of the face blades 3 and the side blades extending out of the side blocks respectively, such that the face blades and the side blades can crack the rock first, which can protect the muck scraping plates 5-5.

[0023] The bottoms of the side blocks 2 are provided with rock breaking tapered plates 9 and muck scraper blades 10 in the radial direction, the rock breaking tapered plates 9 are arranged on one side of the muck scraping chain 5-4, and the muck scraper blades 10 are arranged on the other side of the muck scraping chain 5-4 for the purpose of cracking large rocks and protecting the tools and the muck scraping plates; the driving pulley 5-1 is connected with a driving motor reduction gear 5-7 mounted on one side of the interior of the central block 1; with the driving motor reduction gear, the driving pulleys start rotating to

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drive the muck scraping chain so as to transport the muck; two guide pulleys 5-2 are respectively connected with gripping gears 5-8 mounted inside the side blocks 2 and the central block 1.

[0024] One side of the support cover 5-3 connected with the temporary muck barrel 8 is provided with a muck loading 5-9, which corresponds to a muck inlet of the temporary muck barrel 8. The temporary muck barrel 8 is fixedly connected with the central block 1 and the side blocks 2 respectively, the central axis of the temporary muck barrel 8 is overlapped with that of the central block 1, and the wall of the temporary muck barrel 8 is provided with a muck inlet corresponding to the muck discharge mechanisms 5, which facilitates muck transport and removal. The outer walls of the side blocks 2 are provided with chain grooves 5-10 fit with the muck scraping chain 5-4, and the muck scraping chain 5-4 penetrates the chain grooves 5-10 into the support cover 5-3, such that the muck can be removed and transported while the muck scraping chain can be well protected.

[0025] The cutterhead was driven to rotate downwards by thrust power and torque, the muck discharge mechanisms 5 rotate as the cutterhead revolves. When the tools 3-2 break rocks, the rock breaking tapered plates 9 arranged on the front side of the muck scraping chain 5-4 only allows small blocks of muck to enter the muck scraping plates 5-5 and further break the large rocks peeled off by the tools, large rocks were made into small, the support cover 5-3 can effectively prevent muck transported by the muck scraping plates 505 from splashing, the muck discharge mechanisms 5 convey the muck into the temporary muck barrel 8 during its rotation, and the muck scraping blades 10 arranged on the rear side of the muck scraping chain 5-4 are used for stopping and collecting the muck and leveling and excavating the ground, such that the muck can be efficiently transported and the tools 3-2 and the muck scraping plates 5-5 can be well protected.

[0026] Other structures are the same as those of Embodiment 1.

[0027] The abovementioned are some preferred embodiments of the present invention and not intended to limit the present invention. Any modification, equivalents, and changes based on the spirit and principle of the present invention should fall into the protection scope of the present invention.

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WHAT IS CLAIMED IS:

1. A cutterhead for shaft boring, comprising a central block, side blocks, and muck discharge mechanisms, wherein the central block is of tubular structure, the side blocks are evenly mounted on the outer wall of the lower part of the central block in the circumferential direction, the bottom part of the central block is a tapered surface, and several central blades are provided on the tapered surface, the bottom parts of the side blocks are provided with several face blades and several side blades, the face blades are arranged on the bottom surfaces of the side blocks in the radial direction, and the side blades are arranged at the outer edge of the bottom part of the side blocks; the upper portions of the muck discharge mechanisms are connected to the central block, and the lower portions of the muck discharge mechanisms are connected to the side blocks and project from the bottom surface of the side blocks; and the interior of the central block is provided with a temporary muck barrel, and the temporary muck barrel is in communication with the muck discharge mechanisms.
2. The cutterhead for shaft boring of Claim 1, wherein each muck discharge mechanism comprises a driving pulley and two guide pulleys, the driving pulley is mounted inside the central block through a support cover and above the side blocks, one side of the support cover is connected with the temporary muck barrel, and the other side penetrates the central block to be connected with the side blocks; the two guide pulleys are mounted at the bottom of the side blocks, the driving pulley and the two guide pulleys are arranged within the same vertical surface and distributed in a manner of triangle, the guide pulleys are connected with the driving pulley through a muck scraping chain, the muck scraping chain penetrates the support cover and bypasses the guide pulleys and the driving pulley to form a closed annular triangle structure, muck scraping plates and muck discharge baffles are evenly arranged at intervals on the muck scraping chain.
3. The cutterhead for shaft boring of Claim 2, wherein the length of the muck scraping plates protruding out of the side blocks is not larger than that of the face blades and the side blades protruding out of the side blocks.

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4. The cutterhead for shaft boring of Claim 2, wherein the bottoms of the side blocks are provided with rock breaking tapered plates and muck scraper blades in the radial direction, the rock breaking tapered plates are arranged on one side of the muck scraping chain, and the muck scraper blades are arranged on the other side of the muck scraping chain; the driving pulley is connected with a driving motor reduction gear mounted on one side of the interior of the central block; two guide pulleys are respectively connected with gripping gears mounted inside the side blocks and the central block.
5. The cutterhead for shaft boring of Claim 2, wherein one side of the support cover connected with the temporary muck barrel is provided with a muck loading, which corresponds to a muck inlet of the temporary muck barrel.
6. The cutterhead for shaft boring of Claim 5, wherein the temporary muck barrel is fixedly connected with the central block, the central axis of the temporary muck barrel is overlapped with that of the central block, and the wall of the temporary muck barrel is provided with a muck inlet corresponding to the muck discharge mechanisms.
7. The cutterhead for shaft boring of Claim 2, wherein the outer walls of the side blocks are provided with chain grooves fit with the muck scraping chain, and the muck scraping chain penetrates the chain grooves into the support cover.
8. The cutterhead for shaft boring of Claim 1, wherein each of the face blades and the side blades comprises a holder and a tool, the tools are evenly mounted on the holders, the holders correspond to the tools one by one, the side blades are obliquely arranged at the outer edges of the side blocks.
9. The cutterhead for shaft boring of Claim 1, wherein the central block is connected with the side blocks through flanges, and the flanges are evenly arranged between the central block and the side block .
10. The cutterhead for shaft boring of any one of Claims 1-9, wherein the muck discharge mechanisms rotate as the cutterhead revolves, and muck is conveyed to the temporary muck barrel during rotation.

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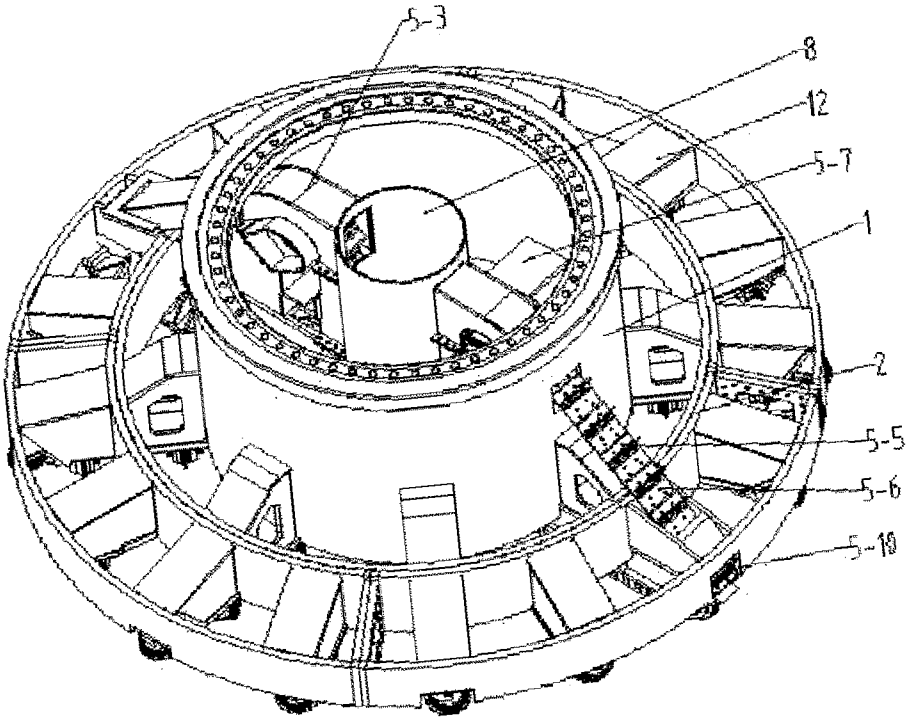

Fig. 1

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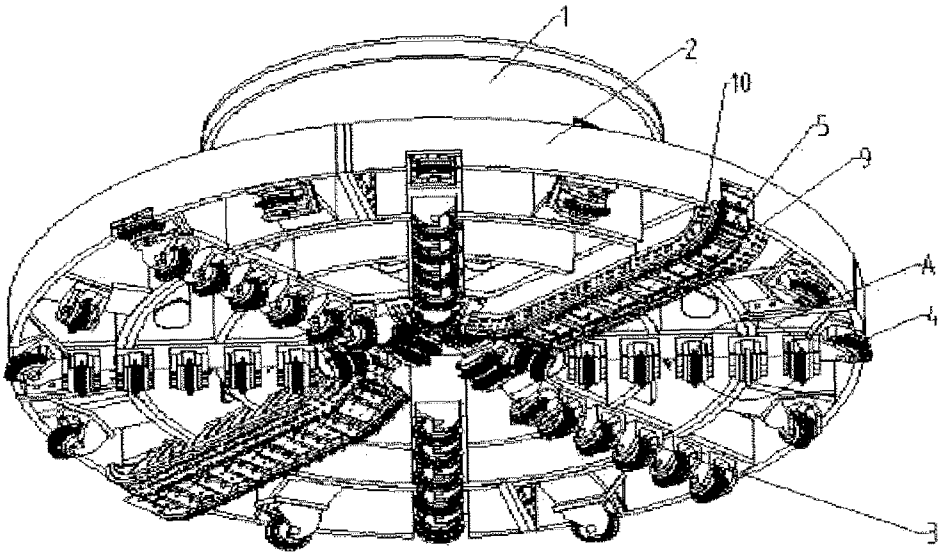

Fig. 2

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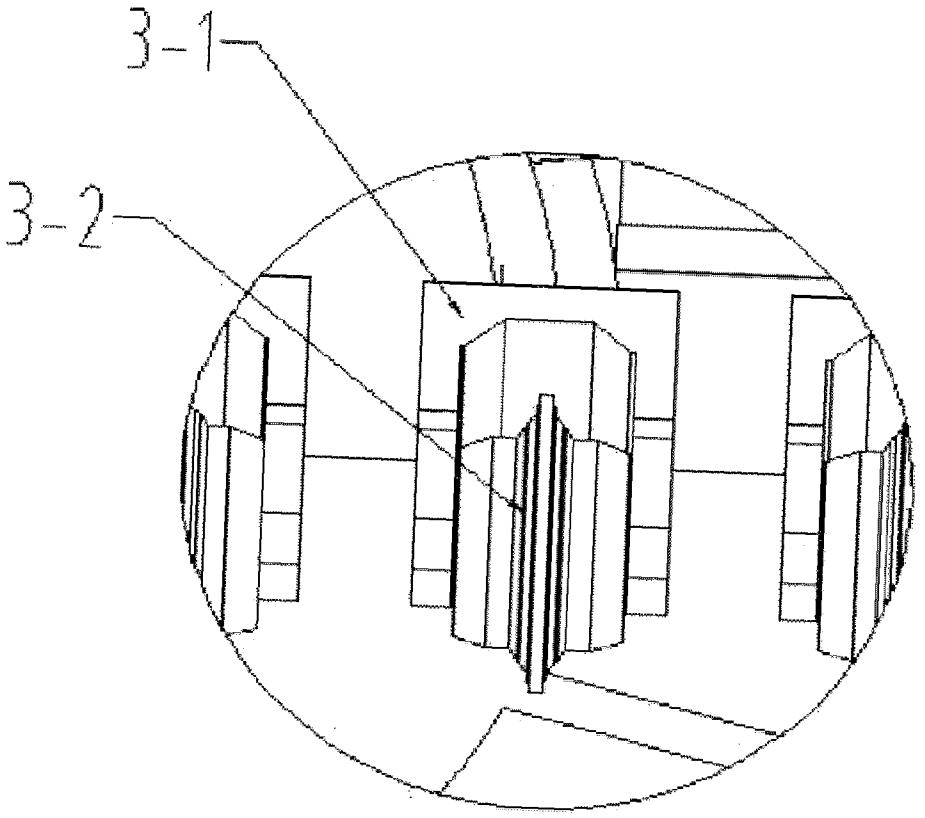

Fig. 3

Date Reçue/Date Received 2020-06-23

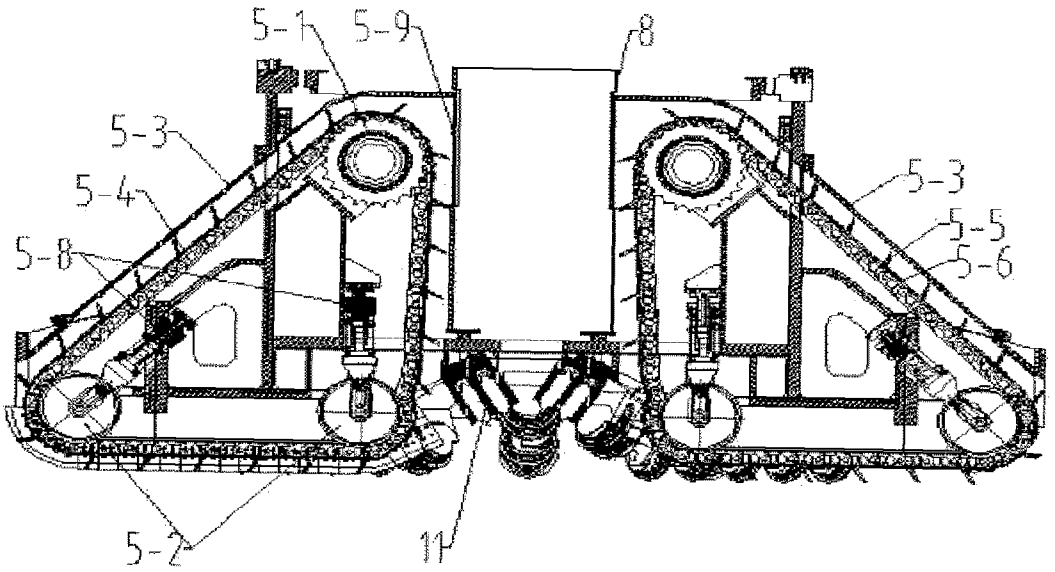

Fig. 4

Date Reçue/Date Received 2020-06-23

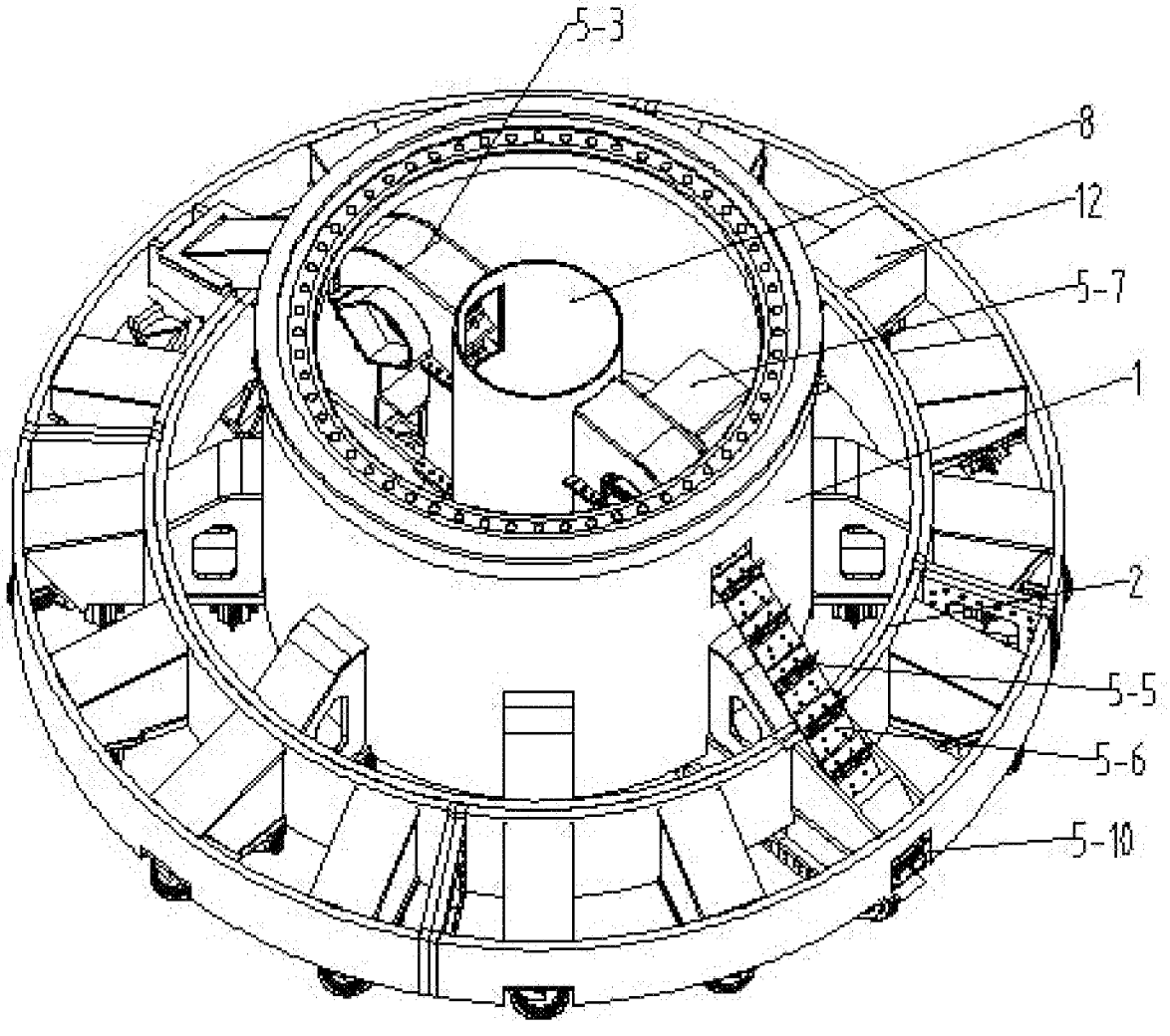

图 1