ISSN 2616-5767 Vol.8, Issue 3: 23-27, DOI: 10.25236/AJETS.2025.080304

Research and discussion on lubricating oil smearing equipment for sliding rail of gantry frame

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Abstract: *Including the main support, the oil storage barrel is installed above the main support , the outside of the double-ended screw rods is provided with an adjustment mechanism that can adjust the width of the slide rail of the mechanical and electrical products of different widths when lubricating oil is applied, and the inside of the main support is provided with an adaptive mechanism that can adjust the oil amount of the slide rail of the mechanical and electrical products of different section shapes and convex parts during the lubricating oil application process. A control mechanism is installed above the inner side of the main support to adjust the size of the oil outlet under the oil storage drum. In this study, the corresponding drain tubing can be effectively squeezed through the flow blocking mechanism, so that the overlapping drain tubing can be effectively pressed and blocked, thus avoiding the problem of oil produced by the drain tubing at the overlapping position, and at the same time improving the uniformity of lubricating oil applied by the brush to the slide rails with different widths and different inner convex shapes.*

Keywords: *Gantry slide rail, lubricating oil, smearing equipment*

1. Introduction

Electromechanical products include agricultural equipment, medical equipment and special equipment, and so on, the most commonly used special equipment is usually the gantry frame of the outdoor dock, and the gantry frame is mainly composed of the frame and the slide, for its slide, it needs for regular application of lubricating oil, the existing lubricating oil application equipment for electromechanical products gantry slide lubricants has the following defects, such as: It is not easy to apply lubricating oil according to the gantry slide rails of different widths and different shapes of sections, especially for the different convex heights of the inner side of the slide rail, it is impossible to adjust the oil output of lubricating oil to apply the slide rail, as a result, the lubricating oil is not enough or wasted when it is applied to the slide with different elevation on the inner side of the slide. In addition, it is not convenient to apply lubricating oil to the sliding rail of the electromechanical products more evenly, thus reducing the service life of the sliding rail of the gantry.

Therefore, it is necessary to provide a lubricating oil coating equipment for electromechanical products to solve the above technical problems.

2. Research Content

First, the purpose of this study is to provide a lubricating oil smearing equipment for electromechanical products. Through the flow blocking mechanism, the corresponding oil discharge pipe can be effectively squeezed, thereby tightly compressing the overlapping sections of the oil discharge pipes to block the flow. This prevents oil leakage from the overlapping areas of the pipes, and the problem of oil produced by the drainage pipe at the overlapping part can be avoided, at the same time, the uniformity of lubricating oil applied by the brush to the slide rails with different widths and different inner convex shapes is again improved, and the amount of lubricating oil is also saved. The technical solution of the utility model provides a solution significantly different from that of the prior art for solving the technical problem that the prior art solution is too single, so as to solve the problem raised in the above background technology.

2.1. Technical Scheme

In order to achieve the above purposes, the technical solutions is as follows[1]: As shown in Figure 1-Structural diagram of product lubricant coating equipment, and as shown in Figure 2-Structure diagram

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of the main plane. The names in the figure are as follows:1. main support;2. oil storage barrel;201. oil outlet; 3. Bidirectional Lead Screw;301. Hand Crank;4. adjustment mechanism;401. let sliding plate;401a. lifting plate;401b. connecting plate;401c. brush;401d. linkage;401e. second sliding groove;403. inner square steel tube;403a. right oil inlet pipe;404. outer square steel tube;404a. oil drain pipe;405. right sliding block;9. servo motor;10. main shaft;11. sprocket mechanism;12. driven shaft;13. directional wheel;14. cylinder.

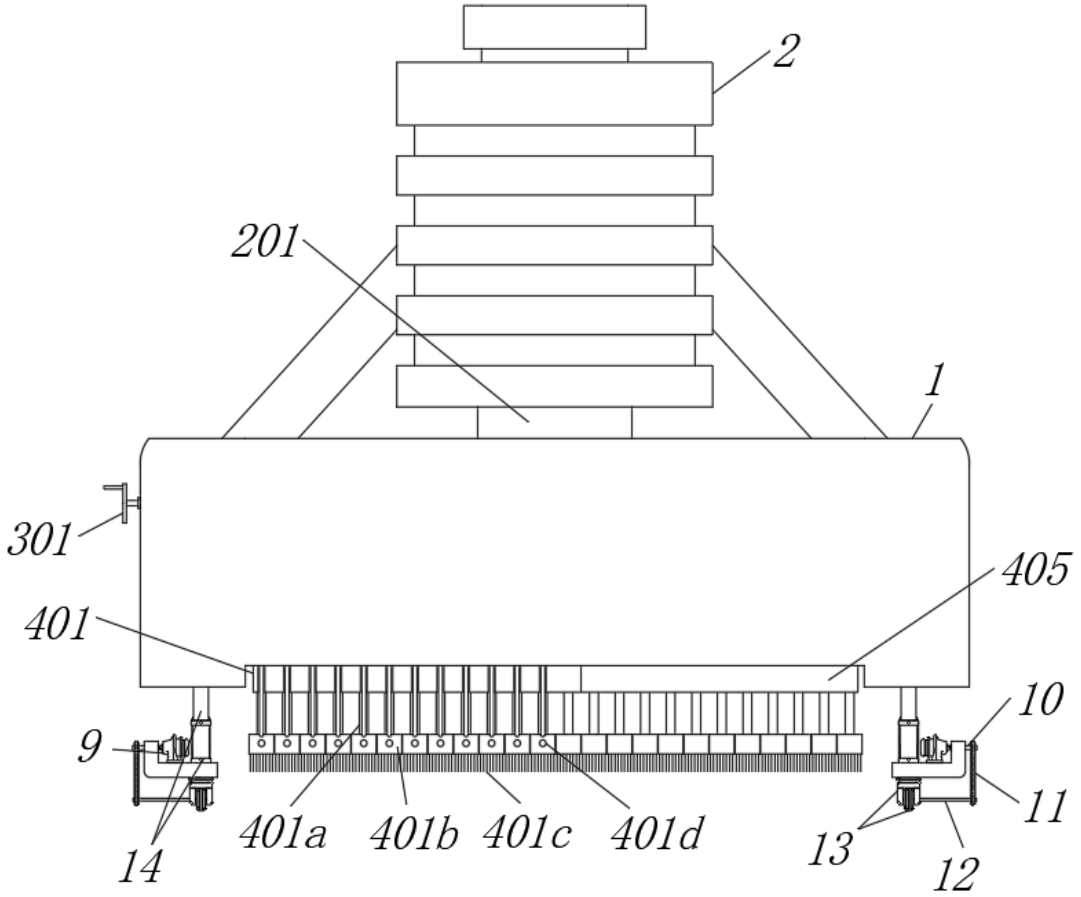

Figure 1: Structural diagram of product lubricant coating equipment

The utility model relates to a lubricating oil smearing device of a mechanical and electrical product, comprising a main support, an oil storage barrel is installed above the main support, and the inner bearing above the main support is connected with a double-ended screw rods, and the outer side of the double-ended screw rods is provided with an adjusting mechanism that can adjust the width of the slide rail of the electromechanical product gantry frame of different widths when the lubricating oil is smearing. The inner side of the main support is provided with an adaptive mechanism which can adjust the oil amount in the lubricating oil application process of the sliding rail of the mechanical and electrical products with different section shapes and convex parts. The inner side of the main support is provided with a control mechanism which can adjust the size of the oil outlet under the oil storage barrel. The inner side of the main support is provided with a flow blocking mechanism that can inhibit the flow of the drainage pipe of the coincidence position, and the right side of the inner side of the main support is also installed with a telescopic slide rod that cannot jack up the corresponding piston block, so that the piston block of the coincidence position cannot increase the escape mechanism of the oil outlet through the extrusion pressure of the oil. The main support is installed on the left and right side of the inner side of the servo motor, and the output end of the servo motor is connected with the main shaft through the coupling, the main shaft connected with the outer key is connected with the sprocket mechanism, and the sprocket mechanism below the outer key is connected with the driven shaft, the driven shaft is fixed with the outer wheel, and the fixed wheel is installed with the cylinder through the L-shaped plate;

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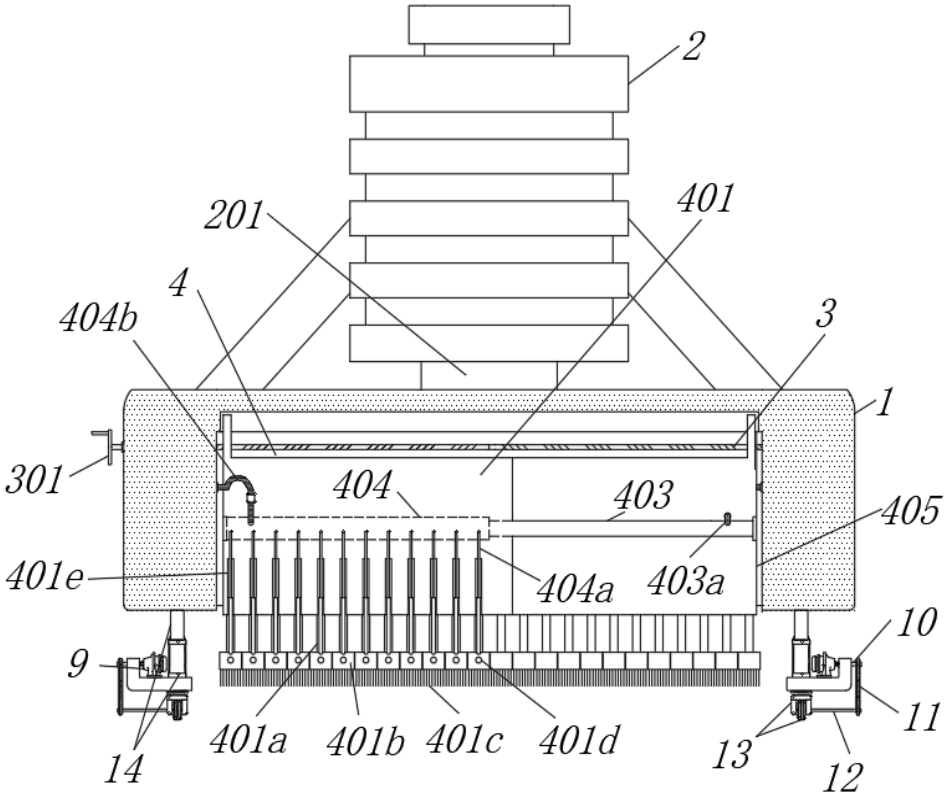

Figure 2: Structure diagram of the main plane

The adjusting mechanism comprises a left slide board and a right slide block threaded on the outside of the left and right ends of the two-way lead screw, and the left slide board and the right slide block are provided with a second chute on the outside side[2]. And the second chute sliding is connected with a lifting plate, the bottom of the lifting plate is installed with a connecting plate, and the bottom of the connecting plate is connected with a brush. The front side of the connecting plate is fixed with a linkage rod, the left slide board and the right slide block on both sides of the corresponding connection with the mounting block and the moving plate, and the left slide board and the right slide block on the side of the corresponding provided with an inner square steel and an outer square steel, the inner square steel and the outer square steel on both sides of the corresponding communicated with the right oil inlet pipe and the left oil inlet pipe, Both sides of the inner square steel and the outer square steel are connected with an oil pipe, the back of the right slider is arranged with a moving plate, the back of the connecting plate is arranged with an oil groove;

The self-adaptive mechanism comprises a connecting cylinder fixed to the side of the two mounting blocks, and the connecting cylinder is connected with an extruded tubing above, the connecting cylinder is connected with a telescopic slide rod below the inner side, and the rear side of the telescopic slide rod is installed with an adjustment plate, the telescopic slide rod is inlaid with a ball, and the telescopic slide rod is connected with a piston block above the telescopic slide. The upper end of the extruded tubing is connected with a pipe fitting, and the inner side of the two pipe fittings is connected with a connecting pipe;

The control mechanism comprises an oil chamber arranged inside the front and back of the main support, and a first spring is arranged on the inner side wall of the oil chamber, two of the first spring ends are fixed with a moving block, and the two movable blocks are internally and slidably connected with a splice plate on opposite sides;

The flow-restricting mechanism includes a vertical elastic telescopic rod connected above the movable plate, and a connecting oil pipe is linked below the movable plate, the lower end of the connecting oil pipe is connected to a horizontal elastic telescopic rod, and the left end of the horizontal elastic telescopic rod is fixed with a valve block;

The avoidance mechanism comprises a lifting block fixed on the rear piston block, and the lifting block is connected with an upper hinged block, the upper hinged block is provided with a square hole, and the

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upper hinged block is connected with a lower hinged block, the lower hinged block is provided with an extruding rod, and the extruding rod is provided with a second spring on the outside. A limit block is installed above the left side of the compression rod[3].

2.2. Preferred Scheme

Preferably, a first chute is arranged above the inner side of the main support, and a vertical plate is arranged at the bottom of the main support, and a lower plate is arranged under the inner side near the left side of the main support, and the end of the lower plate is an arc-shaped upper plate. Preferably, the first chute constitutes a sliding structure with the left slide board and the right slide block. Preferably, the left end of the two-way lead screw is fixed with a rocker, and the rocker is in the shape of a "Z" word. Preferably, the upper end of the vertical elastic telescopic rod is pressed against the lower end of the vertical plate, and the lower right side of the vertical plate is arc-shaped. The end of the upper plate is slidably connected to the rear telescopic slide rod, and the end surface of the upper plate is also pressed against the pressing rod. The front right side of the upper plate is arc-shaped. The upper left side of the lower plate and the lower right side of the adjustment plate form a pressing connection, and the upper right end of the lower plate is also arc-shaped. Preferably, the ends of the two linkage rods are fixedly connected to the lower sides of the opposite surfaces of the two telescopic slide rods. Preferably, the end of the limit block is square-shaped and engages with the square hole on the inner lower side of the upper hinge block to form a locking structure. Preferably, the number of oil discharge pipes corresponds one-to-one with the number of oil grooves, and the outer lower surfaces of the two oil grooves are inclined. Preferably, the outer side of the ball rolls against the inner bottom side of the telescopic slide rod to form a rolling structure. Preferably, the right oil inlet pipe, left oil inlet pipe, and oil discharge pipe are all made of expandable bellows' material with capability of elastic.

3. Research Effect

3.1. Principle Introduction

In this study, a regulating mechanism, an adaptive mechanism, and a control mechanism are incorporated. By rotating the bidirectional lead screw, the left sliding plate and right sliding block are driven to move simultaneously inward along the first sliding groove. This not only enables the square steel and inner square steel to contract relative to each other but also causes the rear-row connecting cylinders and the front-row connecting cylinders to move in opposition via the moving plate and mounting block. Simultaneously, the corresponding telescopic slide rods at the bottom and the attached brushes are driven to move relatively, during this process, the telescopic slide rods, guided by the rollers at the bottom, move along the differently shaped raised sections inside the sliding rail. This movement drives the piston block to compress the oil inside the connecting cylinders, forcing it into the oil chamber. The resulting oil pressure causes the movable block, connected to the linkage plate, to shift accordingly. Compared to existing technologies, this design effectively and adaptively adjusts the size of the oil outlet, thereby enabling self-regulating control over the lubricant volume applied by the brushes to sliding rails of varying widths.

3.2. Research Efficacy1

In this study, a regulating mechanism is incorporated, utilizing the inherent expansion capability of the right and left oil inlet pipes. By adjusting the oil discharge volume, the diameter expansion range of these pipes can be precisely controlled. This enables adaptive regulation of lubricant output in proportion to the varying widths and cross-sectional profiles of the sliding rails. Through the coordinated function of the inner and outer square steel components, the lubricant inside is uniformly distributed from the discharge pipes into the oil grooves and then evenly flows along the inclined sidewalls of both grooves directly onto the brushes, compared to conventional technologies, this design ensures more consistent adhesion of lubricant within the brushes during discharge, significantly improving the uniformity of lubricant application on the sliding rails. Furthermore, when the telescopic slide rods retract in response to varying protrusion heights along the rail's inner surface, the linkage plate, brushes, lifting plate, and oil grooves synchronously retract upward. This innovative approach maintains continuous brush-to-rail contact regardless of differences in cross-sectional geometry or internal protrusion height, facilitating reliable lubricant application across diverse rail profiles under dynamic conditions

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3.3. Research Efficacy2

This study incorporates an adaptive mechanism and an avoidance mechanism. The upper plate effectively presses the push rod at the notch on the back of the connecting cylinder in coordination with the second spring, thereby successfully disengaging the end of the limit block from the square hole on the inner lower side of the upper hinge block. This enables effective overlapping between the rear telescopic slide rod and the corresponding overlapping section of the front telescopic slide rod. When the telescopic slide rod contracts upward due to pressure from protrusions inside the rail, the articulated connection between the lifting block, upper hinge block and lower hinge block effectively eliminates the compressive force exerted by the telescopic slide rod on the piston block.Compared with existing technologies, this design effectively prevents the rear telescopic slide rod from overlapping with the front telescopic slide rod during adjustment - a condition that would otherwise cause the movable block to enlarge the oil outlet and result in excessive oil discharge. Moreover, when the telescopic slide rod ascends, it drives the adjustment plate to lift upward through the coordinated action with the arc-shaped end of the left-side lower plate. This positions the adjustment plate's overlapping section above the lower plate, thereby enabling the front linkage rod beneath the telescopic slide rod to effectively drive the connecting plate, brush, and lifting plate to move upward along the second sliding groove.Compared with existing technologies, this solution effectively disengages the overlapping brush sections from the rail surface, thereby eliminating uneven lubrication caused by redundant application. This innovation significantly improves lubrication uniformity when coating rails with varying protrusion profiles, while simultaneously preventing lubricant waste during the coating process of gantry rail systems in electromechanical products[4].

4. Conclusion

For those skilled in the art, it is evident that the study of the text is not limited to the details of the exemplary embodiments described above, perhaps it may be implemented in other specific forms without departing from the spirit or essential characteristics of this research. So, the embodiments should be regarded as illustrative rather than restrictive in all respects. The scope of this study is defined by the appended claims rather than the foregoing description. And it is intended to encompass all modifications, which for falling within the meaning and scope of equivalent elements of the claims[5]. No reference numerals in the claims should be construed as limiting the claimed subject matter.

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