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OPTIMIZATION OF RAW MATERIAL SHAFT INSTALLATION AND SPEED ENHANCEMENT IN DPZ CHAINSAW WORKING CHAMBERS

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Abstract

This study focuses on optimizing the installation of the raw material shaft in the working chamber of the DPZ chainsaw and increasing its rotational speed to enhance processing efficiency. The raw material shaft is a critical component of the chainsaw, responsible for feeding raw materials into the cutting mechanism. By improving the installation process and boosting the rotational speed of the shaft, this research aims to reduce downtime, enhance throughput, and improve overall performance in wood processing operations. Through meticulous design modifications, precision installation techniques, and motor upgrades, the goal is to develop an optimized configuration of the raw material shaft that maximizes cutting speed and efficiency in the DPZ chainsaw.

Keywords: DPZ sawed gin, raw material, raw material, seed, cotton with seed.

Introduction

The DPZ chainsaw is widely used in wood processing industries for cutting raw materials into desired shapes and sizes. However, the efficiency of the chainsaw is heavily dependent on the performance of its raw material shaft. This study aims to enhance the installation process of the shaft and increase its rotational speed to improve processing efficiency and productivity [1-3].

Key Areas for Improvement.

1. Shaft Installation Precision: Implement precision installation techniques to ensure the alignment and stability of the raw material shaft within the working chamber. Utilize advanced measurement tools, such as laser alignment devices and digital callipers, to achieve optimal shaft positioning and minimize vibration.

2. Bearing and Lubrication Optimization: Upgrade bearings and lubrication systems to withstand higher rotational speeds and prolonged operation. Utilize high-quality bearings with enhanced load-bearing capacity and temperature resistance, and implement automatic lubrication systems to ensure consistent lubrication and minimize friction.

3. Motor Power and Control: Increase the power output of the chainsaw motor and optimize control mechanisms to accommodate higher shaft speeds. Upgrade motor components, such as windings and brushes, to handle increased loads and operating frequencies, and implement variable speed control systems to adjust shaft speed dynamically based on processing requirements.

4. Blade Design and Maintenance: Evaluate blade design and maintenance practices to ensure compatibility with higher shaft speeds and extended operating periods. Implement blade sharpening and replacement schedules to maintain cutting efficiency and prevent premature wear, and explore advanced blade materials and coatings to enhance durability and performance.

5. Safety Considerations: Prioritize safety measures to mitigate risks associated with higher shaft speeds and increased cutting efficiency. Implement safety interlocks, emergency stop mechanisms, and protective barriers to prevent accidents and ensure operator safety during operation [4-7].

The main part

Optimizing the Installation of the Raw Material Shaft:

1. Precision Alignment: The installation process of the raw material shaft within the working chamber of the DPZ chainsaw requires meticulous attention to alignment. Utilizing advanced measurement tools, such as laser alignment devices and digital callipers, ensures the shaft is positioned accurately. Precision alignment minimizes vibration, reduces wear on components, and maximizes cutting precision.

2. Structural Stability: Ensuring the structural stability of the raw material shaft within the working chamber is paramount. Proper fixation and reinforcement of mounting points and support structures prevent misalignment and distortion during

operation. Reinforcing the mounting brackets and ensuring secure attachment to the frame of the chainsaw enhances stability and prolongs the lifespan of the shaft.

Increasing Rotational Speed:

1. Motor Power Upgrade: Enhancing the power output of the chainsaw motor is essential for achieving higher rotational speeds of the raw material shaft. Upgrading motor components, such as windings and brushes, to handle increased loads and operating frequencies is necessary. Higher power output enables the motor to drive the shaft at elevated speeds without compromising performance or reliability.

2. Variable Speed Control: Implementing variable speed control systems allows for dynamic adjustment of the rotational speed of the raw material shaft based on processing requirements. Variable frequency drives (VFDs) or electronic speed controllers enable precise speed regulation, optimizing cutting efficiency and adapting to varying material densities and feed rates.

3. Bearing and Lubrication Optimization: Upgrading bearings and lubrication systems to withstand higher rotational speeds and prolonged operation is crucial. High-quality bearings with enhanced load-bearing capacity and temperature resistance are necessary to support increased shaft speeds. Implementing automatic lubrication systems ensures consistent lubrication and minimizes friction, reducing wear and extending bearing lifespan.

Blade Design and Maintenance:

1. Enhanced Blade Materials: Exploring advanced blade materials and coatings enhances durability and performance under high-speed cutting conditions. Hardened steel alloys or carbide-tipped blades provide superior wear resistance and cutting efficiency, even at elevated shaft speeds. Diamond-coated blades offer exceptional durability and precision for cutting dense or abrasive materials.

2. Maintenance Regimen: Implementing a proactive blade maintenance regimen is essential to maintain cutting efficiency and prevent premature wear. Establishing regular blade sharpening and replacement schedules ensures optimal cutting performance and prolongs blade lifespan. Inspecting blades for signs of wear or damage and promptly replacing worn blades minimizes downtime and ensures consistent cutting quality.

Safety Considerations:

1. Operator Training: Providing comprehensive operator training on safe chainsaw operation is essential when increasing shaft speeds. Educating operators on proper operating procedures, safety precautions, and emergency protocols minimizes the risk of accidents and injuries.

2. Safety Interlocks: Implementing safety interlocks and emergency stop mechanisms ensures rapid shutdown of the chainsaw in the event of a malfunction or safety hazard. Incorporating protective barriers and guards around high-speed components prevents accidental contact and enhances operator safety during operation.

By optimizing the installation of the raw material shaft and increasing its rotational speed in the DPZ chainsaw, significant improvements in processing efficiency, throughput, and productivity can be achieved. These enhancements, coupled with advanced blade design and maintenance practices and stringent safety measures, ensure the chainsaw operates at peak performance while prioritizing operator safety and equipment longevity [8-11].

As a result of installing the raw material shaft in the working chamber of the DPZ gin, which is used in cotton ginning enterprises, ensures the timely expulsion of the seeds separated from the fibre and accumulated in the middle of the working chamber. As a result, it is possible to control the density of the raw material shaft. This, in turn, reduces damage to the seed. Reducing damage to the seed prevents the formation of defects in the fibre.

Saw blades are divided into 130, and 180 blades, depending on the number of saw blades on the saw blade, brush and air jets, depending on the location of the air nozzle, which separates fibres from above or below. But in all sawmills, the main working organ in the technological process of fibre separation is the saw cylinder and rib cage installed in the working chamber. The technological process in the working chamber is carried out as follows: When the diameter of the saw blade is 320 mm and the rotation speed is 730 rpm, the linear speed is equal to 12 m/sec. The rotation speed of the seeded cotton roller reaches 100-130 rpm, that is, it moves at a linear speed of 2 m/s. So, the relative speed of the saw tooth cutting into the seeded cotton mass is 10 m/sec. If we accept these assumptions about the size and shape of the seeded cotton ball, we can see the kinematics of the events that occur in the working chamber of the gin. one can think. In reality, the cutting of the seeded cotton wool is suitable for the shape of the working chamber and is complicated.

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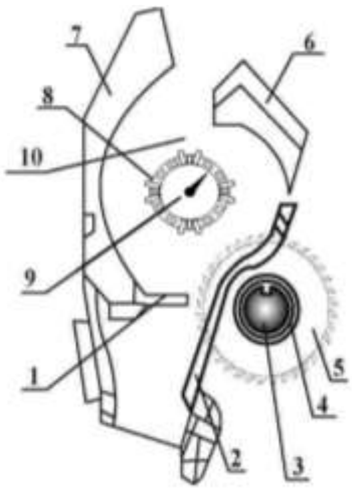

Figure 1. The working chamber of the saw demon

1-Seed comb; 2nd rib (colossal) fence; 3-saw shaft; 4-the gasket between saws; 5-saw cylinder; 6-blade bruce; 7th apron; 8th screw; 9- mesh surface; 10th working camera .

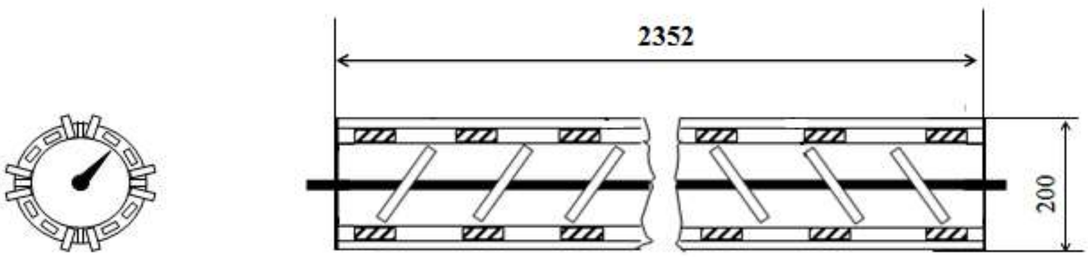

Figure 2. Recommended mesh drum

In addition, in order to produce high-quality cotton fibre, fluff and seed, it is necessary to improve the technical and economic indicators of cotton ginning enterprises, increase production efficiency and prevent the loss of received textile raw materials. Also, additional removal of completely separated seeds from seeded cotton in the working chamber, reduction of density in the working chamber, and improvement of the efficiency of the saw discs for mixing fibre. To increase its effectiveness, the details should not interfere with durability, weight and performance. The fibres caught in the teeth of the saw are carried between the colosniks, and the seeds are not able to pass, and the fibres are separated from the seed. The fibres on the saw teeth are separated by the air stream from the nozzle and transferred to the common fibre drawing pipe. Since the slits in the working part of the colosniks are not larger than 3.2 mm (the size of the smallest seed), the seed cannot pass through, it is attached to the rotating seeded cotton roller (raw material roller) and continues to rotate until all the fibres are separated. is enough. The seeds separated from all the fibres lose their ability to stick, the seeds are separated from the cotton boll (raw material boll) and fall to the surface of the colostrum and then down its slits. The degree of hairiness of the seeds coming out of the gin is changed with a comb. Continuous feeding of seeded cotton into the working chamber of the gin, continuous removal of fibre and separated seeds from the gin ensure continuous operation of the saw gin. - under the influence of the object, it begins to accumulate in the middle of the working chamber. The mesh drum 9 installed in the middle of the working chamber pushes it out. The auger 8 in the mesh drum is designed to rotate in both directions, so it helps to remove the seeds separated from the fibre.

Conclusion

Thus, seeds separated from the fibre and accumulated in the middle of the working chamber are expelled in time. As a result, it becomes possible to control the density of the raw material. This, in turn, reduces damage to the seed. Reducing damage to the seed prevents the formation of defects in the fibre.

Optimizing the installation of the raw material shaft and increasing its rotational speed in the DPZ chainsaw presents an opportunity to enhance processing efficiency, throughput, and productivity in wood processing operations. By focusing on key areas such as shaft installation precision, bearing and lubrication optimization, motor power and control, blade design and maintenance, and safety considerations, significant improvements can be achieved in the performance and reliability of the chainsaw. Through collaborative research, rigorous testing, and continuous refinement, the goal is to develop an optimized configuration of the raw material shaft that maximizes cutting speed and efficiency in the DPZ chainsaw, ultimately benefiting wood processing industries worldwide.

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