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Design of Maize picker device

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Abstract: At present the Maize picker has the large power consumption problem. The paper design a Maize picker device, the device is effective to reduce the power consumption of corn harvest machine work. By the virtual prototyping technology, completed the design of the overall structure of the Maize picker device.

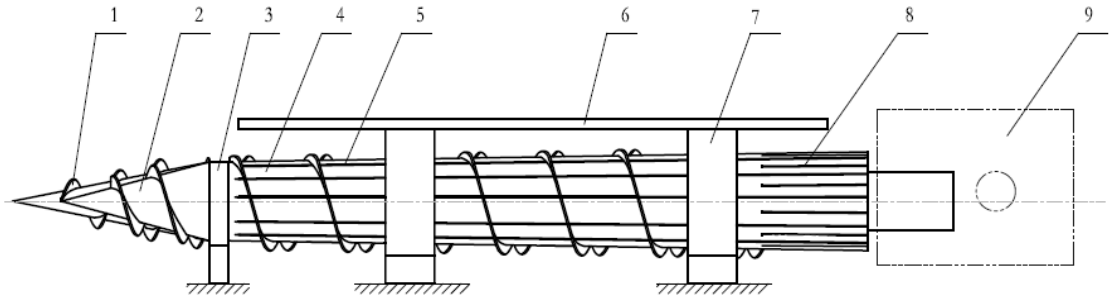
Introduction

Maize picker device is one of the important part of corn harvester [1, 2]. Currently corn harvester snapping principle is through a pair of snapping roll inward rotation , corn stalk toward the gap among, the while continuing to move forward, pull the bottom to send, larger diameter corn ear not through the gap , and been left off the hook at the top of snapping roll , and finally slid elevator vessel; [1,2,3]. Because corn ear is hard to pull off, so Maize picker mechanism is relatively large energy consumption , resulting in corn harvester power to a large.

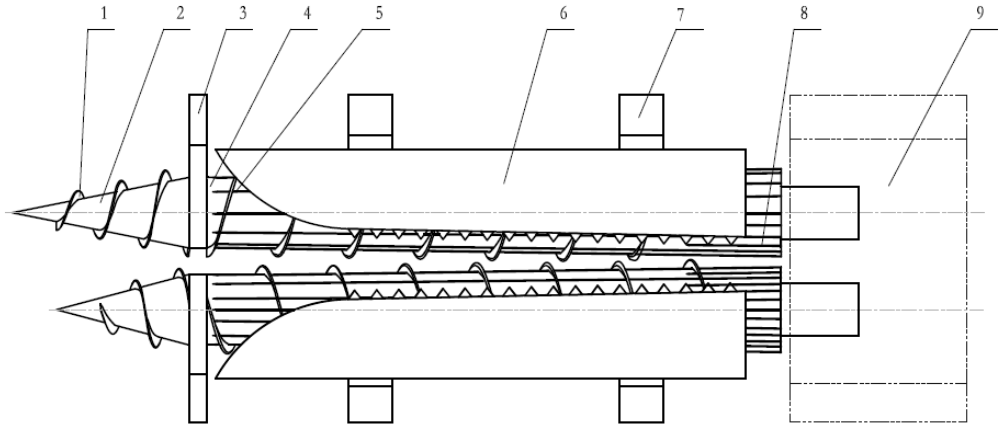
At present, the hilly area in Southwest China and in urgent need of small corn harvester, the machine power is relatively small, if still follow the traditional stripping mechanism will increase the power equipment, will not meet the requirements of small power harvesting corn. The project is to design a new kind of maize picker device, effectively reduce the power consumption, applicable to the consumed power small hills mountains small corn harvester.

Structure and working principle

Overall structure design. This paper studies maize picker device of small corn harvester is composed of blade, vertebral shaped head, former support, snapping roll, long lacing, stripper plate, support, short reinforcement, gearbox etc.. Structure diagram of maize picker device design is shown in Figure 1 (a), (b) are shown.



(a)



(b)

Fig.1 Structure diagram of maize picker device:
(a) Front view; (b) Top view

1 Blade; 2 Vertebral shaped head; 3 Former support; 4 Snapping roll;
5 Long lacing; 6 Stripper plate; 7 Support; 8 Short lacing; 9 Gearbox

Working principle. When corn harvester on line into corn, the machine movement forward, each row of corn has a pair of rotation relative to the inside of snapping roll, two rolls of vertebral rotation snapping corn stalk toward the rear of the snapping roll gap , the two rotating rollers constantly snapping pull back below to send corn stalks; Because the machine is moving forward, so the maize plants relative to backward and downward movement speed, because the corn ear diameter is larger, it cannot pass through the stripper plate space, it is blocked in the corn stripper plate, and a stripper plate with teeth, and between the two a stripper plate gap is more and more small, when stem rearward and downward movement, corn ear stem contact connected to a stripper plate, stripper plate like a blade sawed to pull off connect stem, corn ear in the stripper plate, then slipped into the elevator; Remove the spike stalk continues downward movement, the stripper plate gap and stem diameter of similar size, so the saw-tooth of stripper plate to stem can't saw pull or only in the epidermis layer, with stalk backward movement, stalk diameter becomes smaller, the roll gap will gradually become smaller, to the rear snapping roll of strong tension, corn ear was basically finished picking, corn stalk was fast, tough out of machine body, to complete the process of stem from the machine.

Snapping roll virtual design

In this paper, the maize picker device is design through the virtual 3D. Virtual design technology provides a product design environment, optimize the product design process, to research and development of new products provides a strong support. By using the virtual design technology, which can improve the design quality, reduce design errors and manufacturing costs. Holes distance adjustable mechanism structure design by UGNX software [4].

Structure virtual design. Snapping roll mainly comprises vertebral shaped head, blade, 3 long lacing, short lacing, axis, etc.. Snapping roll virtual assembly is shown in figure 2.

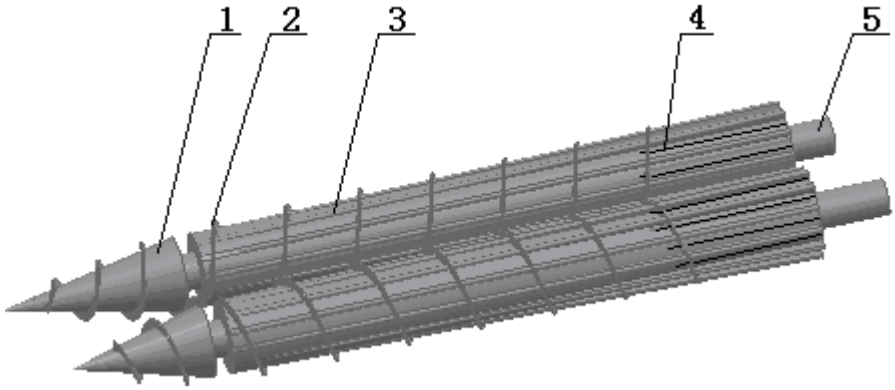


Fig.2 The virtual assembly of Snapping roll

1 Vertebral shaped head; 2 Blade; 3 Long lacing; 4 Short lacing; 5 Axis

Snapping roll structural characteristics. In order to ensure the snapping roll has a good maize picking function, this paper developed the snapping roll along the axial direction including, the front conical head, middle roller body and rear roller tail section. Snapping roll design has a certain taper, from the middle roll front end face to the back of the roll of the tail end, roller diameter are gradually become larger, so regardless of corn stalk diameter, stalk can be the introduction of two roll gap, and snapping at different sites, there is no need to adjust the two roller spacing; In the middle of the roller body and tail section of the rear roller surface, along the axial direction of snapping roll is arranged through a long stretch and blade, on the back of strong snapping roll tension zone do not install the blade, increase the short transverse reinforcement, which can slow the speed of stalk backward movement, increase stalk under tension and speed corn stalk, be especially at the upper end of the stalk pull out force machine body. In addition, snapping roll conical head and central body surface spirally arranged leaves, two snapping roll consists of a pair of spiral roller rotate inward, conveying to stalk.

Maize picker device overall virtual assembly

Through 3D software UG, the maize picker device is 3D modeling, assembly, and interference detection between all parts [4]. The results showed that there was no interference between each components, the device has reasonable structural design. The maize picker device of small corn harvester overall virtual assembly is shown in figure 3.

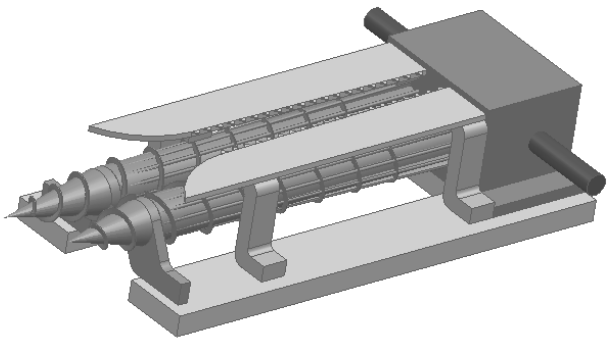


Fig.3 Maize picker device virtual assembly

Conclusion

Maize picker device installed in a small corn harvester cutting platform, through the small taper snapping roll, so that the different diameters of the corn stalk was introduced gap between two rollers and snapping in different parts. The removable ear was picked by saw-tooth on the Stripper plate sawing connection stems, so as to realize the separation of grain and stem. This scheme avoids the ear had been from the stalk to squeeze off a larger power consumption of the defects, the use of small power reached the ear and stalk separation target. The maize picking device has the advantages of simple, compact and reasonable structure, convenient assembly and disassembly, and less energy consumption, effectively reduced the machine power. The device has been successfully applied for a national patent of utility model, which provides a new idea for the design of small corn harvester.

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Reference

[1] Ding Weimin. Agricultural Mechanics. Beijing: China Agricultural Press. (2011), In Chinese

[2] Wang You, Zhang Qiang, Yu Lulu. Maize picker device Application Status and Prospects, No.1 (2011), P.228-231, In Chinese

[3] Zhang Dehui. Energy-saving and no row corn harvester picking mechanism research, No.5 (2011), P.525-527, In Chinese

[4] Zhang Lihua, Lv Xiaorong. UG NX6.0 computer-aided design and making practical tutorial. Beijing: Peking University Press. (2009), In Chinese