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Design of peanut shelling and compressing integrated machine

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Abstract
This paper designed a peanut shelling and compressing integrated machine, which was mainly divided into cutting mechanism, separation mechanism and compressing collection mechanism. The cutting mechanism adopted the wheel extrusion structure design, which can realize high peanut peeling rate and low damage rate of peanut pulp;The machine adopted eccentric shaft vibration and crank connecting mechanism and elastic rod design to realize the screening of peanut shell and peanut particles; The compression collection device can effectively reduce the volume of peanut shells, so as to facilitate the subsequent reprocessing and utilization of peanut shells, which is beneficial to environmental protection.

Keywords: *Peanut sheling; runner extrusion structure; connecting rod mechanism; compression collection.*

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I. INTRODUCTION

Peanut shells are generally discarded as garbage, which is not environmentally friendly and easy to cause environmental pollution.

At present, the peanut shelling machine on the market has a low shelling rate, a high rate of kernel damage and loss after shelling, and there are also problems such as unstable machine performance and low utilization rate. There is also a lack of a product that can recycle peanut shells. Therefore, it is necessary to design a peanut shell and peanut kernel separation and compression integrated machine that can recycle peanut shells. Its aim is to collect peanut shells and peanuts separately, and collect and compress peanut shells to reduce their volume, in order to facilitate subsequent processing and utilization, and improve resource utilization.

II. OVERALL STRUCTURAL DESIGN

2.1 OVERALL STRUCTURE

According to the above design requirements, the integrated machine for shelling and compressing mainly includes: feeding structure, cutting mechanism, separating mechanism, compressing mechanism and transferring device. As is shown in Figure 1.

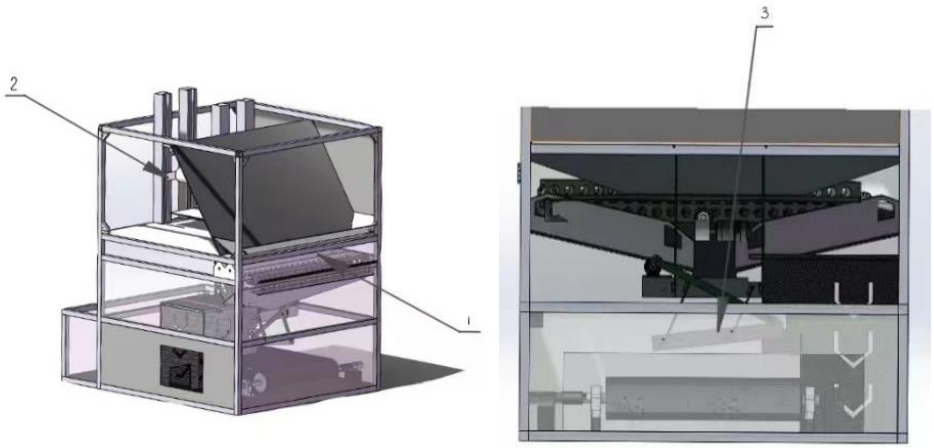

Figure1: Overall model of peanut shell meat separation and compression machine

2.2 CUTTING MECHANISM

The cutting mechanism adopts the runner extrusion structure, as shown in Figure 2,which is mainly realized by the motor to give a higher speed of the roller, and the peanut breaks the shell. Peanuts slide into the rollers through inclined limit plates, and the two extrusion wheels rotate relative to each other at different speeds. When the peanuts enter the working area of the two rollers, they are in close contact with the two roller surfaces. At the same time, the peanuts are subjected to the normal displacement compression of the two roller surfaces. When the peanuts reach the vicinity of the central connecting line, the normal displacement compression pressure is maximum, and the peanuts undergo plastic deformation under compression. At this time, the shell of the peanuts also ruptures under the displacement compression effect. Under the opposite direction of compression, the peanuts complete shelling and are sent to the upper plate structure of the vibrating screen by the inclined limit plate, thereby achieving preliminary cutting of peanuts.

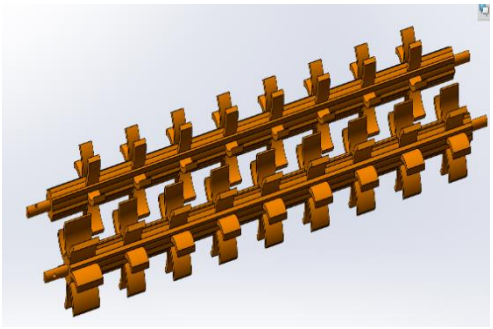

Figure 2: Cutting mechanism model diagram

2.3 SEPARATION MECHANISM

The separation structure mainly consists of a vibrating screen with upper and lower parts, as shown in Figure 3 . It adopts eccentric shaft vibration and crank connecting rod mechanism and elastic rod design. After being cut, peanuts enter the upper vibrating screen through an inclined limit plate for periodic vibration screening. When peanuts enter the vibrating screen disc, due to the slightly larger diameter of the sieve disc, the peanuts will fall into the lower conveyor belt through the aperture with the cooperation of the vibrating machine. A blower is installed on the right baffle of the conveyor belt to perform secondary air blowing treatment on the peanuts with less peanut shell debris falling from the upper layer of the vibrating screen into the lower layer, maximizing their shelling efficiency. The peanut shells left on the upper sieve plate after separation will also apply a certain amount of wind force to it, while allowing it to enter the limit plate for the next transportation process, thereby achieving the function of the separation mechanism.

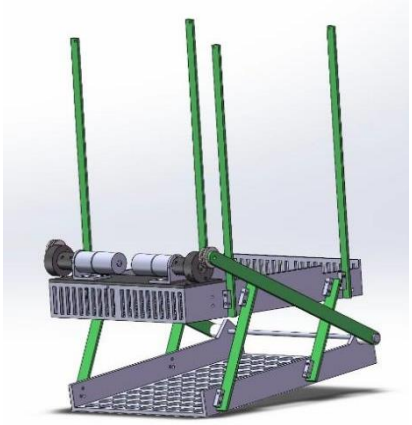

Figure 3: Separation mechanism

2.4 TRANSFERRING DEVICE

The transferring device is as shown in Figure 4. It mainly used to transport peanut kernels that have passed through the separation mechanism. After the peanuts are separated by the upper screening plate, the peanut shells undergo secondary separation under the action of the blower located on the right side of the conveyor belt baffle, and then enter the compression device through the collection bin for compression. The peanut kernels are transported through the conveyor belt to complete the collection process.

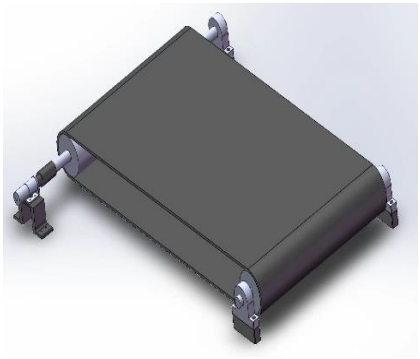

Figure 4: Transferring device

2.5 COMPRESSION MECHANISM

As shown in Figure 5, the peanut shells screened by the vibrating screen are sent to the compression mechanism for compression, which mainly adopts an electric push rod structure. After secondary separation of peanut shell debris in the separation structure, it is blown into the pressure plate below the compression mechanism through the side plate pores. The peanut shells collected from the upper layer of the vibrating screen after screening are then dropped into the limit plate through the side plate. The peanut shells are then collected at the bottom after periodic compression by the compressor and sent out from the discharge port baffle. During the compression process, the volume of peanut shells decreases, providing a new way for the subsequent collection and reuse of peanut shells.

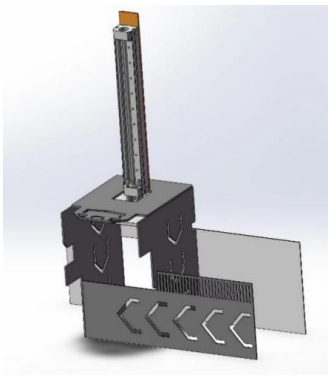

Figure 5: Compression mechanism

III. CONCLUSION

The peanut shelling and compressing integrated machine has the advantages of simple working principle, compact structure, easy control, and convenient production, realizing the mechanization of peanut shell. It can well separate peanut shell kernels and improve production efficiency and production quality. Adding peanut shell compression and storage device can effectively collect peanut shell, reduce the volume of peanut shell, so as to facilitate the subsequent reprocessing and utilization of peanut shell, which is conducive to environmental protection and also improve the utilization rate of resources.

REFERENCES

[1]. Wu Yan, Wang Jianwen, Liu Daoqi, et al. Suggestions for revision of technical conditions and test methods of peanut peeling machine [J]. Agricultural Engineering, 2022,12 (11): 5-9.
[2]. Yang Xiaocheng, Wang Dongwei, Li Xiujie, Design and simulation analysis of the low-loss peanut peeling device [J]. Agricultural mechanization research, 2022,44 (12): 95-100.
[3]. Zhang Xingyu, Chen Weigang, Wang Hecheng, et al. Intelligent peanut and sunflower melon seed shell stripping machine [J]. Light Industry Machinery, 2019,37 (06): 12-15.
[4]. Tong Qingtan, Wang Yanyao, Wang Dongwei, et al. Design of the peanut shelling [J]. Agricultural mechanization research.2017, 39(02): 112-116.
[5]. Yang Mingxuan. Technical transformation of extrusion peanut shelling machine [J]. Machinery.2017, 44(09): 71-75.
[6]. Pu Lianggui, ji Minggang. Mechanical Design (tenth edition) [M] Beijing: Higher Education Press, 2019..
[7]. Cheng daxian. Mechanical Design Manual (sixth edition):Mechanical drive [M]. Beijing: Chemical Industry Press, 2017.