

High-speed cleaning device for residues in peanut harvesting land

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Abstract

As one of the important oil crops, the planting area of peanut has been increasing in recent years. However, due to the unique growth mode of peanuts, there will generally be peanut residues in the ground after the peanuts are mature and harvested. Now, manual cleaning and digging are mostly used, or the existing peanut harvester is used to clean up the peanut. Both methods have their disadvantages. Therefore to suit our country farmland homework, we designed a can of land within the residual peanuts to clean the product, by designing a unique peanuts collection device and cleaning device, can very good residues of peanuts to clean inside the land, in the process of cleaning can also loose on land, in addition to miscellaneous, replaced the artificial within the land on peanut clean up, and the reasonable design, convenient operation, in line with the social demand, is worth to popularizing agricultural machinery field.

Keywords

Peanut, mechanization, residue removal.

1. Significance of the project research

Peanut is China's planting area is large and has stronger international competitiveness of one of economic crops and oil crops, the peanut production in our country in the world, about 35% of the total world peanut production, the main planting area in subtropical and cool, especially in shandong, henan, hebei, guangdong, guangxi, liaoning, sichuan and anhui more concentrated concave. Peanut harvest seasonality is strong, the labor intensity of manual operation is high, the efficiency is low, the harvest loss is large, the occupation of agricultural time is much. However, peanut has been regarded as a cash crop for a long time and the mechanization of peanut harvesting is only regional, so the mechanization of peanut harvesting has not received enough attention. While the mechanization of wheat, rice and other major food crops has made great progress, peanut harvesting in China is still dominated by manual work, which is relatively backward compared with the developed countries and regions in the world. This project is mainly aimed at peanuts after harvest, there is a large amount of peanut loss. This not only makes farmers suffer economic losses, but also is not conducive to later crop replacement. And this product realizes the mechanized harvest of peanuts, farmers reduce economic losses, but also meet the concept of environmental protection development, to achieve the purpose of harmonious development between man and nature.

2. General idea of the project

Agricultural peanut harvest with land remain high speed cleaning device, mainly includes the guide plate, guide plates are described on the surface of a fixed installation has a handle and the guide plates are described on the surface on the left side of the fixed pump installation, described in the guide plate surface under symmetric fixed installation of helical spring,

described the spiral spring bottom with nuts, internal set of helical spring has stated support bar, as described in the lower support bar install a universal wheel.

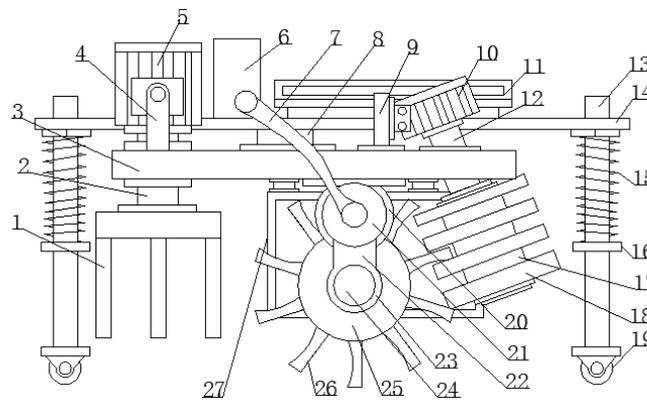


Figure 1: Schematic diagram

3. Research content

The purpose of this product is to solve the shortage of the existing technology and provide a high-speed cleaning device for the residue in the land for agricultural peanut harvesting. This product is realized through the following technical solutions: Including guide plate, guide plates are described on the surface of the fixed installation has a handle and the guide plates are described on the surface on the left side of the fixed pump installation, described in the guide plate surface under symmetric fixed installation of helical spring, described the spiral spring bottom with nuts, internal set of helical spring has stated support bar, as described in the lower support bar install a universal wheel, described under the guide plate surface have connection rod welding, connection plate is described in the bottom link rod welding, described the connection plate setting of upper has a first motor, described the first motor and the connecting plate fixed installation, connection between side under the first motor installation has described the first rotating shaft, Described the first rotating shaft bottom stirring tooth fixed installation, described the connection plate surface have connection box on the right side of the fixed installation, under fixed connection box is described before the installation of aggregate net, described the connection plate is on the right side of welding with mounting bracket, described in the installation frame fixed on the right side, a second motor described under the second motor side to install a second shaft, described the second shaft surface underside fixed installation of the first drum, described the first drum surface evenly with brush, described the connection plate surface under fixed installation of central water dish, described water plate fixed installation have water in front of the plate, described under water plate locating rod side fixed installation, Described the lower locating rod welding thimble, thimble described within the set with the third axis, as described in the third second drum shaft surface fixed installation, as described in the second drum surface evenly welding gear shaper, described the third third motor shaft back-end installation, as described in the third shaft surface back set equipped with link, described the connection between ring and connection plate welding has a fixed link, described the third motor with fixed link between fixed installation location. As the preferred technical scheme of this product, the stirring tooth is made of steel material and has a claw structure. As the preferred technical scheme of the product, the guide plate is symmetrically provided with a groove corresponding to the support rod. As the preferred technical scheme of the product, the nut is threaded with the support rod. As the preferred technical scheme of the product, the clearance between the gear shapers is less than 1.6cm. As the preferred technical

scheme of this product, the first motor, the second motor and the third motor are all waterproof motor, and the outlet end of the water pump is communicated with the conduit.

4. Innovation points and project features

4.1. it's innovative

- (1) Easy to clean up the residual peanuts in the soil;
- (2) No waste of peanuts;
- (3) Manual can be operated without tractor traction.

4.2. Project Features

This product is convenient for human to move, convenient operation, by setting the first motor, which drives the stirring tooth for turning, to loose soil, thus facilitating the peanut leakage within the residues in the soil, have the effect of the tiller, by setting the third motor, which can make the second drum rotation, make the gaps between the gear shaper collection of peanut, peanut card in gap between gear shaper, by setting the water pump, and then by water to flush plate to the peanut, will wash away the soil on peanut, peanut and the separation of the soil, by setting the second motor, the rotating brush, To dial out gap between gear shaper of peanuts, peanut into aggregate network, realize the collection of peanut, digging the this product set, collection, removing impurity, realize the efficient collection of peanut, avoid to cause waste residue in the land of peanuts, replaced the traditional mining by artificial within the land on the peanut, clear, and can meet the demand of farmers in our country existing in design, easy to operate, is worth to popularizing agricultural machinery field.

5. Key technology of products

After the completion of the technical route for peanut harvest, the soil will remain within the peanuts, at this time will need to use this device to collect, peanuts for residual peanut collection, first of all to prepare work, driving a car, put water tank inside the car, inside the water tank into the water, is placed on the car battery at the same time, the first motor 5, the second 10, 31 third motor and pump 6 connect battery, an operator to drive the car, holding the handle 11 another operator, to promote the device, then the first motor 5, the second 10, the third the switch of motor and pump 31 6 open at the same time, Press down the device at the same time, makes the stirring tooth contact 1 land, the first motor 5 will drive the first 2 rotational axis, the stirring tooth 1 as the soil is on the ground, have the effect of the tiller, the peanuts up within the residues in the soil, the third motors to drive the second drum 31 will turn 25, use gear shaper 26 gaps between peanut jam, then the pump 6 through water plate 20 to peanut water spray, to separate the soil on peanut and peanut, implementation of peanut clean, as the rotation of the second drum 25 through 10 second motor to drive the first 17 the rotation of the drum, The rotation of the brush 18 can transfer the peanuts stuck in the slot of the tooth 26 to the aggregate net 32, so as to realize the collection of peanuts. Thus, the residual peanuts in the soil can be collected quickly through the device.

6. Market analysis

We are in the market for a variety of peanut harvesting machinery for the contrast, when the peanuts mature, to peanuts after harvest, generally in the ground with peanut residue, for these residues, most of the existing artificial clean mining, was carried out on the buried in the ground peanut harvest, so as to realize the peanut harvest, but the efficiency is lower, so also more arduous, and also not easy to clear of peanut residue in soil, cause waste to peanuts, the use of the existing peanut harvesting machine to clear the land within the residual, relatively large

equipment, generally need to use the tractor traction, artificial difficult to move, And it is not easy to separate the soil on the peanut quickly.

Chinese peanut production mechanization is seriously lagging behind, especially the employment quantity more than one-third of the whole process of production and operation costs accounted for over 50% of the total production cost of harvesting operations, mainly rely on artificial to complete, labor intensity, high operation cost, low efficiency and high cost of large losses, have become the main bottleneck of production development and industrial growth, domestic demand for peanut harvesting mechanization technology and equipment has become increasingly urgent. And now there are combine harvesters, which are very large and suitable for large areas, but for the remote areas, people can't have the big equipment of combine harvesters, so we can fill the gap.

7. The conclusion

With the increasing demand for agricultural mechanization, the development of China's agriculture needs to be effectively combined with modern science and technology, so as to adapt to the continuous development of The Times and realize the continuous advancement of China's agricultural economy. The two main production links of wheat and corn crops have realized mechanized operations, as soon as possible to reduce the labor force, to realize the mechanized operations of peanuts is the urgent need of many farmers. This product is compact and convenient, suitable for farmers in most areas of our country, worth popularizing.

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References

- [1]Jia Zhenzhen. Peanut mechanized harvesting mode and equipment research. *Agricultural Technology and Equipment* .06(2020),p.23-24+27.
- [2] Zhai Xinting, and Chen Mingdong. Compilation of load spectrum of peanut combine harvester seedling and vine gripping and conveying system. *Acta Agricultural Machinery* 51.S1(2020) , p.261-266+363.
- [3]Zheng Yali. Experimental study on air-suction fresh flower cleaning and impurity removal device. 2019. Shenyang Agricultural University, MA thesis.
- [4] Lv Shangwu, et al. "Design and Research of Peanut Impurity Removal (Cleaning) Classifier." *Agricultural Mechanization Research* 41.09(2019) ,p.71-75.
- [5] Zhang Peng, Yang Yong, and Zhu Weiwei. Optimization of key structural parameters of peanut harvester based on finite element simulation technology. *Mechanical Research and Application* 28.06(2015) ,p.44-48.
- [6]Chen Zhongwu, Zhang Jiulei, and Liu Hua. Simulation design of peanut digging and harvesting equipment based on Solidworks. *Modern Agricultural Equipment*.05(2014) ,p.52-55.