

## Design of One-Stop Coin Finishing Organization

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**Abstract.** The device is mainly for the banking, public transportation and other financial industry users design, through the control of the motor to achieve different types of coins automatic screening, automatic clearing function, put forward a new coin separation device. Innovation is mainly reflected in: the use of a unique principle of the wheel to promote the coin separation; the use of chute way to clear the coins, increase the separation efficiency; in accordance with the coin size of their own diameter, to achieve the automatic separation of coins to achieve the problem of artificial separation of difficult coins. At the same time, due to the use of screening devices, clearing devices, making the currency classification, inventory, finishing easier, reducing manufacturing costs, banks and other industries of the money clearing market has a positive meaning efficiency.

### Design Background

Banks, buses, supermarkets and other sectors, companies and other industries often need to deal with a large number of coins, such as counting, classification, packaging, etc. to make it re-circulation. And in the current world, coins with its low cost, circulation times, wear-resistant, easy to recover and other irreplaceable advantages will occupy a large number of small denomination of money market. The market requires a mature and reliable coin automatic processing machine, so it is of great significance to develop a mechanism for dealing with the above problems.

Coin Finisher is a technology product used to inventory coins in the financial industry equipment. Its main function is the counting of coins and the clearing of coins. At present mainly applicable to the supermarket, bus, vending industry, retail and other industries. Coin finishing machine simple and generous, clear principle of equipment. Easy to understand, affordable, in the supermarket, retail and other industries popular. The biggest advantage of coin finisher is that it can not only count the number of coins, the currency can be separated from each other, and the face of different countries do not need to adjust the coins of the coin, only need to adjust the machine's hardware equipment can meet different The country's coin inventory needs. So not only occupy a large market share, but also for the production costs have also been reduced.

### The Main Content of the Study

In this paper, the design and development of the "coin separator", proposed a coin separation device. We designed a coin separation device for the public transport industry and the banking industry, which has two main functions, one, automatic separation of coins; Second, the automatic screening of various denominations of coins.

(1) coin consolidation system design: the development of coin consolidation machine feasibility program.

(2) the overall structure of the system design: the composition of the system part of the screening, the detailed part of the structural design.

(3) system comprehensive performance test: the design of the "coin sorting machine" to verify the feasibility of the system to run the system to simulate the experimental environment and related experiments to test the performance of the system.

### Finishing System Program

**Separation Step.** The specific separation step is such that the first coin through the transmission device, the timing of quantitative transfer of a part of the coin to the separation disk, at first we are separated by a coin of 1 angle, so the first block and the distance between the design of the guide Of the coins than the angle of slightly larger than the coins of other coins have a smaller diameter, as a standard and then through the experimental separation effect, we determine a suitable diameter, so that the angle of coins and other currency the coin is distinguished.

The working principle is as follows: start the motor, the motor drives the separation disc, making the separation disk rotation, the separation of coins in the disk for centrifugal movement, coins are allocated to the rails, the distance between the block and guide the size of the order from top to bottom. And then adjust the distance between the bins and the guide rails from small to large according to the size of the coins to separate the coins of different diameters. The device diagram shown in Figure 1, our coin sorting machine by the screening part of the feed port, DC motor, screening board, banknote collection box; clear part of the coin slide.

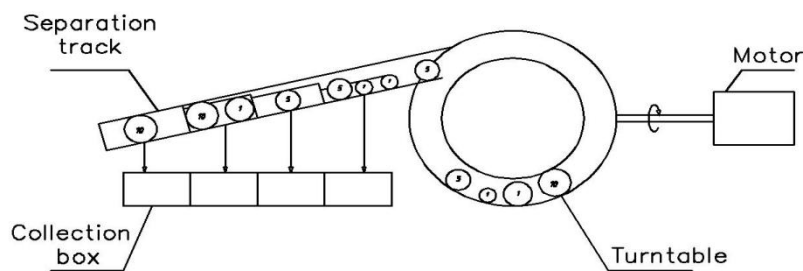


Figure 1 Device schematic

**Coin Drive Design Principles.** The coin into the chute with the holding device to ensure that the coin into the holding device can have a certain tilt angle to ensure that all the coins to the tilt track to prevent coins have residual and missing, with the motor drive cone wheel, With the rotation of the cone wheel, the coins of different sizes can be transferred to the inclined track, and the inclination design of the track can prevent the coins from being transferred to the rail coins to overlap, resulting in clogging the coin channels, resulting in inaccurate separation. Simple mechanical principle will coin separation, saving a lot of manpower and material resources, just put the coin into the full load device, the generator drive, the whole system will be able to run normally, simple, convenient and fast.

**Automatic Clearing Principle.** From the screening box inside the coins will be one by one into our design of the clear plate, in the design of the partition board we have taken the following measures: First, the right side of the plate to play different height of the side slot, the height of the side trough As the diameter of the coin, the second is the clearing board and coin finishing machine box has a certain tilt angle, the third is the clear plate and the ground into a certain angle.

The height of each side of the groove is the diameter of the different coins, the coin will choose their own side of the corresponding side of the sink to fall; clean plate and coin finisher The box has a certain tilt angle, for the coin fall to provide gravity; clear plate and the ground into a certain angle, to ensure that the speed should be forward. Workflow shown in Figure 2. This design, not only to ensure the accuracy of the clearing device, but also to achieve the efficiency of the clear.



Figure 2 Overall working flow chart

### System Overall Structure Design

The simulation prototype designed in this paper is designed to verify the rationality of this function, so the design of the part is simplified under the premise of realizing the function. In the design process, we used PRO / E, UG, AutoCAD and other modern mechanical design software-aided

design, through the ADAMS virtual prototype simulation, in the physical prototype before processing, the prototype of the future performance of the indicators Fully foreseen, thus shortening the design time, improve the design quality and design efficiency.

The cleaning device is mainly composed of a cleaning plate and a collection box. When each coin from the screening box into the clear plate, because the clear plate and the ground into a certain angle, this will make the coin with the power forward, so as to achieve coins in the clean-up board walking; The box into a certain angle, so that the coins in the process of walking from the side of the tank to fall; because the height of the groove in order of a coin, 5 coins, 1 yuan coin diameter length. To ensure that the coins of different denominations can be from the different side of the sink to the collection box, and then collect the coin inside the box will fall into the collection tube, and thus successfully into the packaging device.

The advantage of this structure is the low cost, high accuracy, can effectively separate the coins of different denominations into different collection boxes, the biggest possibility is the problem of clearing the plate, which affected the separation efficiency of coins, so we Will be through a lot of calculation and post-commissioning, to find a most appropriate tilt angle. So the clearance of our project is reasonable and effective.

### **System Comprehensive Performance Test**

The simulation environment is a reproduction of the real environment, and all the parameters of the small agricultural automatic cleaning tank are based on the simulation environment. Therefore, the simulation environment is of the utmost importance. Taking into account the laboratory environment and out of the demonstration space constraints, we have the system model ADAMS software simulation.

### **Development Conclusions and Innovation**

In this paper, the coin sorting machine is designed and developed successfully. All the design of the prototype according to engineering practice requirements, through ADAMS simulation, the overall performance, key indicators have reached the design requirements. "Coin separation machine" involves the course of mechanical design, mechanical manufacturing, theoretical mechanics, fluid mechanics and mechanical automatic control. The system is proposed and discussed to change the original way of clearing, to achieve automatic screening; automatic clearance; automatic packaging, and made a detailed theoretical analysis and experimental verification, you can automatically separate the coins; The above conclusions show that we designed the system basically reached the requirements of engineering practice, in the practical application will play a huge role in the process of completing the work process to ensure the use of appropriate means to maintain a smooth, safe and reliable action; Developed a set of coin consolidation machines for the banking industry, which meet the current "efficient" and "convenient" social real needs. Automatic coin finishing machine two innovative points: the principle of a unique shaker will be different types of coins separation. chute way to clear the coins, increase the separation efficiency.

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