International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 5 Issue 3 ǁ Mar. 2017 ǁ PP.21-26

Mechanism Optimization of Plastic Paper Packaging Machine

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PROJRCT NUMBER: 16KY0111

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ABSTRACT: The production and circulation of the increasing socialization,modernization makes the product packaging has been rapid development.Packaging in the important position of the exchange of goods in the market has become increasingly prominent, has generally attracted the attention of people.Mechanization, the universal application of automation equipment, more dynamic in these areas, the packaging industry is no exception.Now most of the packaging process has been converted into mechanical operations by hand.This not only reduces the degree of labor, but also to speed up the production rate to improve productivity, but also to make the form of packaging in the continuous improvement, innovation, so that the majority of consumers are generally able to accept.This objectively promoted the marketing of products, improve the competitiveness of products in the market, but also can bring high profits for the enterprise.Through the comprehensive evaluation and selection of many kinds of schemes, this paper determines the continuous plastic paper packaging machine.The machine to achieve high-speed, continuous, with high productivity, low power consumption, the use of simple, reliable and convenient maintenance and so on.

Keywords: Bearing box packing line Plastic paper packaging machine Paper cutting part Top paper parts

I. CHARACTERISTIC DESCRIPTION OF PACKAGING MACHINE

Most of the mechanical structure and mechanism of the packaging is complex, and the movement speed is fast and the action with high requirements.The food and drug packaging machine is easy to clean with medicine and food hygiene and safety requirements.The working force of the packaging actuator is generally small, so the motor power of the packaging machine is small.Packaging machines are generally used continuously variable speed device, in order to flexibly adjust the packaging speed, adjust the packaging machine production capacity.Packaging machinery is a special type of professional machinery, a wide variety of production limited.

In order to facilitate the manufacture and maintenance, reduce equipment investment, in the design of packaging machine should pay attention to standardization, versatility and versatility.High automation of packaging machinery, most of the PLC, SCM control, to achieve intelligent.Packaging machinery to achieve the specialization of packaging production, greatly improve the production efficiency.Packaging mechanization reduces the labor intensity, improve working conditions, protect the environment, save raw materials, reduce the cost of products.To ensure the health and safety of packaging products, improve product packaging quality, enhance the competitiveness of the market sales.To extend the shelf life of the product, to facilitate the circulation of products.Products using the packaging machine, can reduce the area of packaging sites, saving infrastructure investment.

II. IMPLEMENTATION OF WORK

packing machine with the engine, a control system, is packaged goods supplying system, packaging material feeding system, packaging operation execution system, main transmission system, transmission system, finished product output system auxiliary device,

the fuselage the ten part.Engine output power through a speed reducing device (6) promote the movement of each link, material into the feeding conveyor belt (5) delivered to the folding mechanism 4 to send a paper cutting mechanism of packaging to thrust bearing, press paper, a paper feeding mechanism (3) the packaging materials forming conveyer to a conveyor that is a packaging process Holden the.

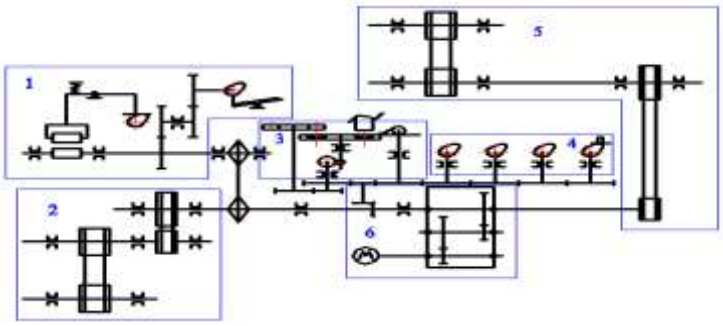

Fig. 1 total transmission system

One of the most important mechanisms in mechanical packaging is the realization of feeding, roll of paper, pressure side, unloading, into the output conveyor belt of the process of an organization.It is made from the thrust bearing, the press, the top paper is a folding cam, the top membrane cam, the top material cam, the discharge tray, the conveyor belt, the disc shaped body, paper cutting knife, roll film, feeding conveyor belt, the four parts of the push material 10 parts.As shown in Figure 2.

Bearing from the conveyor belt into, be a pusher four-bar mechanism is pushed into the disk shaped bodies, plastic paper by the drum into and through the grooves of the paper cutting knife cut after the fall into the disk shaped bodies, Geneva mechanism below the disk shaped bodies turn 90 degrees into the station 2, the folding mechanism of the paper is folded, wheel groove again rotated 90 degrees into the station 3, from the apical membrane of the cam to the paper into the top bearing, wheel groove rotation into the station 4, by a top feed cam bearing jacking unloading plate. Finally, unloading tray bearing into a material conveying belt.Feeding and cutting mechanism by a cam makes the friction wheel and the friction wheel to achieve the intermittent feeding.

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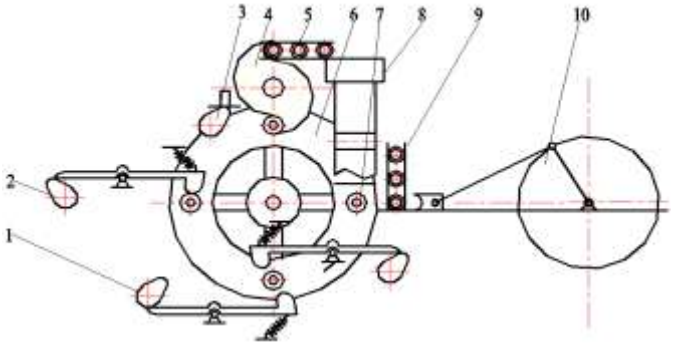

1—Origami cam ; 2—Paper cam ; 3—Unloading cam ; 4—Dump tray ; 5—Discharge conveyor belt 6—turntable;7—Blanking hole; 8—Paper feeding paper cutting mechanism ;
9—Input conveyor belt ; 10—Crank slider mechanism

Figure 2 push bearing, pressure paper, top paper mechanism

2 Transmission ratio design of transmission mechanism

The design and calculation of the gear reducer requires that the motor speed is 960r / min, the bearing packing number is 60 / min, so the gear reducer is reduced to 16 I.The belt wheel transmission requires that the belt pulley transmission ratio should be adjusted by the feed belt and the discharging belt.Bevel gear modulus of demand for the number of 2 teeth are 20, the transmission ratio i=1.Groove wheel requires 4 straight slot drive ratio i=4.The bevel gear to the groove wheel requires that the drive ratio is 1

The bevel gear to the crank sliding block requires the same cycle as the groove wheel. The driving ratio is 1.Grooved wheel to origami cam calls for periodic same so I take a sprocket send paper mechanism to obtain the same and the grooved wheel cycle so the transmission ratio i=1.

III. DESIGN OF SEVERAL CORE COMPONENTS

3.1 Design of top feed cam

Top feeding mechanism is mainly used for the heart flat bottomed straight moving follower disc cam mechanism, the main function is to the bearing from the mold in order to discharge mechanism will be sent to the conveyor belt.Due to he = 0.062 cam mechanism design of eccentric distance, radius of base circle r=320, push h=150, Hugh nearly 90 DEG, push the process at an angle of 135 DEG, such as acceleration, and deceleration motion, far resting 45 degrees of angle, return angle of 90 DEG simple harmonic motion.

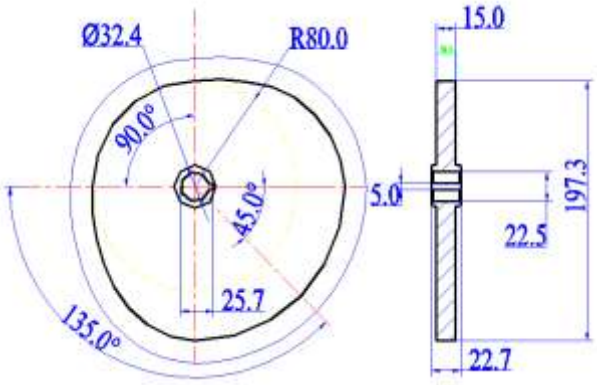

Figure 3 CAM

3.2 Groove wheel design

The groove wheel mechanism is composed of a groove wheel with four straight grooves and a dial and a frame with a cylinder pin.Dial for the driver, with a constant rotation.The groove wheel is a driven member, which is used for one-way intermittent rotation.When the cylinder pin enters the radial slot, the slot wheel rotates; when the cylinder pin exits the radial groove, the groove wheel is stationary, and the dial plate rotates around, and the groove wheel rotates for a week.

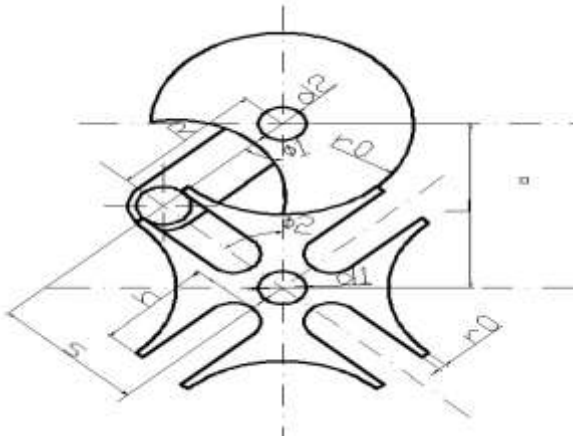

Figure 4 groove wheel mechanism

Table 2 design parameters of groove wheel

project	Calculation basis	computing result	project	Calculation basis	computing result
Φ1	By structure	45°	h	h≥s-(L-R-r)	54.00
Φ2	By structure	45°	r0	R-r-b	50.22
L	By structure	100	b	Experience value 3~5mm	4.00
R	R=Lsin(π/z)	70	d1	d1<2(L-R-r)	20.00
z	3≤z≤18	4	d2	d2<2(L-h)	20.00
s	$s=\sqrt{r^2+(L\cos\varphi_2)^2}$	71.64	γ	γ=360°-2Φ1	270°

3.3 Design of low speed gear

The minimum diameter value of the small gear:

$$d_{3t} \geq \sqrt[3]{\frac{2K_tT_1}{\Phi_d\varepsilon_\alpha}\cdot\frac{u\pm1}{u}(\frac{z_Ez_H}{[\sigma_H]})^2}\cdot=\sqrt[3]{\frac{2\times1.6\times32.15\times10^4}{1\times1.58}\times\frac{4.5}{3.5}\times(\frac{2.433\times189.8}{468.55})^2}=93.34mm$$

Bending strength calculation:

$$m\geq\sqrt[3]{\frac{2\times1.83\times321500\times0.88\times\cos^2 14^\circ}{1\times25^2\times1.58}\times0.02407mm}=2.87mm$$

The modulus of bending strength is 287mm, and close to the standard value of round I, according to pitch diameter I contact strength calculated, calculate the number of gear teeth:

$$z_3=\frac{d_3\cos\beta}{m_n}=\frac{68.19\cos14^\circ}{3}\approx22$$

Gear tooth number: $z_4=22\times3.5=77$

3.4 Design calculation of shaft

Power of high speed shaft $P_1=2.178kw$, rotation rate $n_1=940r/mm$, torque $T_1=22.13N\cdot m$ Because the structure and the work need to be fixed as the gear shaft, so the material must be the same as the gear material, are 45 steel, heat treatment for the modulation process, Material coefficient A_0 is 120。Minimum axis diameter of shaft:

$$d_{\min} = A_0 \sqrt[3]{\frac{P_1}{n_1}} = 120 \times \sqrt[3]{\frac{2.178}{940}} = 15.88mm$$

The smallest diameter here is obviously the diameter of the shaft coupling.Select the aperture of the half coupling $d = 20mm$, Half coupling length $L = 52mm$, Half shaft coupling and hub hole with length $L_1 = 38mm$.

5 Selected calculation of high speed shaft bearing

The bearing is designed to form face to face and is expected to live for 3 years, that is, 12480 hours.The basic rated dynamic load value of the bearing is obtained.

$$C_1 = P_1 \sqrt[\varepsilon]{\frac{60nL_h^{'}}{10^6}} = 498 \times \sqrt[3]{\frac{60 \times 940 \times 12480}{10^6}} = 4430N$$

$$C_2 = 150.3 \times \sqrt[3]{\frac{60 \times 940 \times 12480}{10^6}} = 1337N$$

According to the calibration results for the primary bearing 7206C, its dynamic load rating were I, so to meet the conditions.

IV. SELECT MOTOR

Reasonable choice of motor type, the work of mechanical and effective work, as well as the reliability of the unit operation, safety, energy saving and reduce the cost of equipment are of great significance.Motor type selection to starting from the requirements of the load, consider working conditions and load characteristics, production process, power supply and so on, as far as possible to meet the following aspects of the requirements: should be appropriate with the motor determined by the motor type mechanical properties and mechanical properties, unit stability; motor starting torque, maximum torque, pull in torque performance can meet the requirements of mechanical work.Motor speed to meet the requirements of the working machinery, its maximum speed, speed change rate, speed stability, speed, variable speed and other performance can meet the requirements of the working machinery.

Table 3 corresponding motor parameter list

NO.	Motor model	P/kW	Motor speed r/min		Motor quality kg	总传动比		
			The same turn	Full turn		Total transmission ratio	High speed level	Low speed level
1	Y100L1-4	2.2	1500	1420	34	24	6	4
2	Y112M-6	2.2	1000	940	45	16	4.5	3.5

Considering the size, weight and total transmission ratio of the motor and the transmission device, the structure of the transmission device is compact, and the weight and the price of the motor are considered. The choice of scheme 2 is that the selected motor is Y112M-6.

V. SUMMARY

Plastic paper packaging machine, to solve the traditional manual packaging, saving a lot of time and labor problems, and the packaging speed, accuracy is also very good, practical, and the quality of the packaging out of good efficiency.Using CAD Auto design software to the key parts of the packaging machine system is drawing, accurately describes the key dimensions of components and accessories, the design was checked and modified.To determine the relevant parts are coordinated, solves many of the problems need to be solved in the manufacture of the prototype before.In the case of no replacement of the functional components, only in the case

of the appropriate adjustments to the different objects, different packaging requirements to achieve packaging.For example: how to further improve the reliability and coordination of the system operation, so that the system has a certain ability to the failure of the failure.With the expansion and efficiency of production, how to make the packaging machine has more scale and production efficiency, which requires more integration with the advanced mechanical components.This is the trend of the future.

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