Motion Analysis and Size Determination of Step Feeder

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Abstract

The linkage mechanism of the stepping feeder is designed, and the transmission ratio should be allocated reasonably when designing the transmission system. First of all, we should look up a large number of relevant information, have a certain understanding of the machinery designed by them, and find that there are many available transmission mechanisms to select the best, the motor is selected according to the data given, and the reducer is also the standard part, which can be selected. It is the feeder that regulates the transportation of material parts on a prescribed route. It can be transported horizontally, vertically, tilting and space. The feeder has long haul distance and large conveying capacity, so it is widely used. Generally speaking, it is the machine to carry out the work piece intermittently. The transmission device often uses the reducer, and has many advantages. It can work smoothly, the transmission is accurate, and the instantaneous transmission ratio is constant. This design has an inevitable impact on the later period. It is a huge and detailed project. Any plan cannot be discussed in the air. It needs reasonable calculation and analysis. It is also a very effective method to speed up the design progress.

Keywords

Step feeder; machinery; transmission ratio.

1. Introduction

1.1 Development Prospect of Step Feeder

The rapid development of science and technology has led to the improvement of the economy. People's consumption concept has also been increasing with increasing demand for the market. In the market, various kinds of machinery, such as lifting machinery, conveying machinery, air compressors, industrial robots and crushers, have appeared in the market. In order to meet the needs of the market, some enterprises make improvements with higher requirements and develop more products that meet the requirements. Designing product development is the first step to determine its performance, level and function. Labor saving, rationalization and automation are increasingly becoming the themes of design. Therefore, the application of feeder is very extensive, and all kinds of processing operations are inseparable from mechanical transmission. Today's age is the age of intelligence. Machinery slowly takes the place of manpower, and is favored and liked by people. The technology and assembly of the feeder itself have been greatly improved, which can achieve long distance, high transport volume, high speed and so on. Long distance transportation can be carried out under the mine to send out the materials under the mine. On construction sites, this equipment is used to transport some of the materials that manpower cannot meet, such as this heavy reinforced concrete, which also protects the safety of the human body.

1.2 Operation Mode and Characteristics of Step Feeder

It is a belt conveyor and cannot stop the transport of materials machinery. After the conveyor belt is around the drum, the end is connected to the ring, and it needs tightening. The conveyor belt and the material on it are supported by certain components. The rotary cylinder operates with a driving device, because the friction between the conveyor belt and the roller makes the conveyor belt work. Now, the

most widely used one is the walking feeder. It has a number of advantages, high productivity is the first feature, followed by its long distance, work and reliable, easy to operate, energy consumption is very small, easy to maintain, and even more people cannot think of it can carry people. It can be used everywhere, without you, in busy factories, construction sites, farm products processing bases, or power plants everywhere. Deliver materials in a lax processing workshop; transport ore in metallurgical plants; transport concrete in construction industry; port loading and unloading cargo. The conveyor belt is easy to wear and will be replaced soon. Its price is not very cheap. Such equipment is indispensable in the field of transportation. It is a kind of mechanical device that conveyed material continuously. Nowadays, it is intelligent, the manpower is slowly fading away. The step feeder is the intelligent pronoun. It has replaced the manual handling of the previous people. It is indispensable to the assembly line.

2. Motion Analysis and Size Determination of Step Feeder

2.1 Motion Analysis of Step Feeder

The design of the motion scheme is an important part of the mechanical design. The performance of the whole machine and the development of the future are closely related to the formulation of the motion plan. The reasonable motion analysis can help the designers to understand the performance better and the design is more perfect.

The motion mode of the connecting rod mechanism is varied. In terms of simplicity, the linkage can be moved, rotated and swinging. From the complexity, the movement in the space can be realized, and it can be used to realize the motion of the known motion trajectory. The structure of the low side surface contact has some advantages, it is very convenient to make, the high precision is easy to be obtained, the contact surface is easy to lubricate, and it is not easy to destroy. It is widely used in various mechanical products. There is no absolute perfection, which cannot be achieved in advance, but is approximately achieved in the realization of a very complex movement. As the movement is complicated, more help is needed. It is conceivable that the machinery will become heavy, and the self lock will occur in serious case, causing unnecessary trouble. When the speed is high, due to their own conditions, shock absorption decreases, and some unnecessary bumps come, so the noise pollution is great. So we must make good use of it.

2.1.1 A Brief Introduction to the Linkage Mechanism

With the rapid development of the connecting rod mechanism, the popularization of the computer and the rapid development of science and technology, the innovation and development of the linkage mechanism have also been greatly improved, and the precision and speed of the design have been greatly changed. Yes, the introduction of microelectronics opens up the introduction of the multi degree of freedom linkage, which has greatly simplified from the structural angle or the design angle. Generally speaking, linkage mechanisms can be divided into two categories: space motion and plane motion. According to the number of components, it can be divided into four rods, five rods, and in turn, more than four rods can also be called multi bar mechanisms. The planar four bar linkage is also called the hinge four bar mechanism. According to the requirements, it can be divided into three forms: double crank, double rocker, crank rocker and so on. Their appearances are two connecting rods are crank, two connecting rods are rocker, one is crank and one is rocker.

2.1.2 Design of a Hinge Four Bar Mechanism

The design of hinge four bar mechanism usually includes motion type selection, load capacity determination, structural analysis, motion analysis and so on. Selection is particularly important. Choosing the right type can play a simple role. It can determine the composition of the structure, the type of movement, the number of the movement pairs, draw the motion diagram, and make clear the parameters of the construction. Load carrying capacity is based on the strength theory to check the strength of the mechanism to see if it cannot meet the stress requirements. The design of the organization should not be underestimated. There are many aspects to consider.

The plane connecting rod feeding mechanism is the main design content, which requires that the linkage mechanism can accurately complete the required motion trajectory. The guiding components are orderly carried out in order in order, and the given positions are approximately given. A certain function curve is formed, which requires active parts and follower can approximately complete the movement of the trajectory curve. In addition, we must meet some rigid requirements, such as pressure angle, transmission angle, quick return characteristic and so on. The most important thing is to satisfy the continuity of motion, reasonable design, prevent death spots, any dislocation, disorder in the operation of the organization is not to appear.

The design of planar linkage is mainly composed of two kinds of analytic method and graphic method. Graphic method or geometry method is the use of given data to coordinate the geometric relationship. The existence of error is unavoidable in organizations with high miscellaneous degree, so the design accuracy of this method is relatively low. The analytic method is based on the data given by the equation for reasonable calculation, compared with the graphical method, its intuition is poor, but the design accuracy is high. If the conditions permit, it is more recommended to use or graphic method, it more accurately reflects the rod length.

2.2 Design and Calculation of Transmission Mechanism

1. Both the active part and the driven part should approximately complete the prescribed track.

2. The connecting rod must complete a certain track and occupy a series of predetermined positions.

3. The plane four bar mechanism has the conditions for the existence of the crank:

(1)The sum of the length of the shortest rod and the longest rod is less than the sum of the lengths of the other two rods.

(2)The shortest rod must be one of the rack or connecting rod. The two conditions are met at the same time. If the rod is the shortest rod, the mechanism is a crank rocker mechanism. If the frame is the shortest rod, the mechanism is a double crank.

2.2.1 Calculation of the Length of Each Rod

It is known that the T1 and T2 values can be used to form the K=t1/t2 of velocity ratio. $t_1 = 1\, t_2 = 2$ obtain k=0.5

$$\theta = 180°(K-1)/(K+1) \tag{1}$$

$$\theta = 60^{o}$$

The maximum rocking distance of the known rocker is 300mm, and the angle of the limit position is 60. The following is to find the fixed hinge A To this end, C2M C1C2 and C2C1N=90 [theta], C2M and C1N are given to P, and then the circle of the delta PC1C2 satisfies the C1AC2= theta at any point on the arc C1PC2, so the fixed hinge should be selected on this arc. The position of the point has been determined, and then the length of the crank and the connecting rod can be determined, a= (AC2-AC1) /2, b= (AC2+AC1) /2. Since the trajectory of the CD bar is a symmetrical figure, the D point should be on the center line of the C1C2, and finally determine the length characteristics of the mechanism that the length of the rod should be satisfied.

Table 1. Length of each rod

Rod number	AB/mm	BC/mm	CD/mm	AD/mm	CE/mm
Rod length	72	163	251	164	102

The substitution formula 4-2 can be obtained: 72+251 < 163+164 is in line with the length condition of the crank rocker mechanism [4]. The distance between the highest point of the trajectory curve is higher than that of the line section AB, and the distance is less than 50mm, avoiding the unnecessary collision of the mechanism in motion.

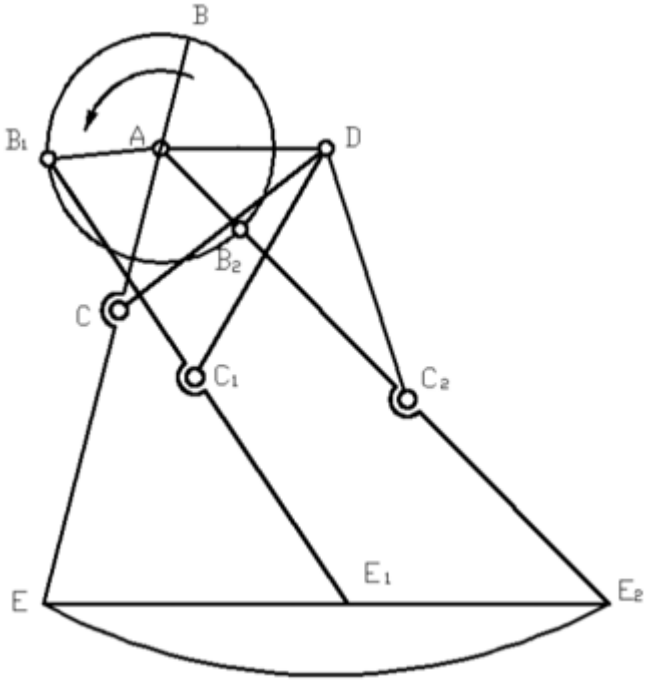

Figure 1. Institutional motion diagram

2.2.2 Kinematic Analysis

The speed of the output point E; uv=0.0021m/s/mm

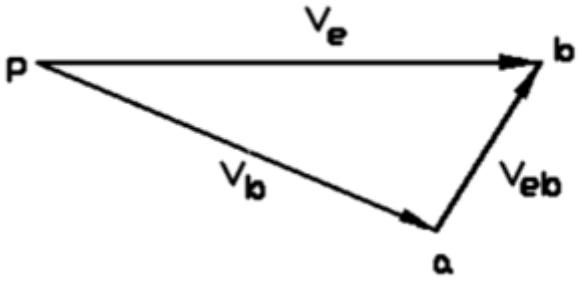

Figure 2. Speed analysis chart

VE=VB+VEB

ω2=2×3.14×10/60=1.05rad/s

VB=ω2×AB=1.05×0.072=0.0756m/s

VE=0.0021×40=0.0084m/s

The acceleration of the output point at E point; $u_a = 0.00105/s^2/mm$.

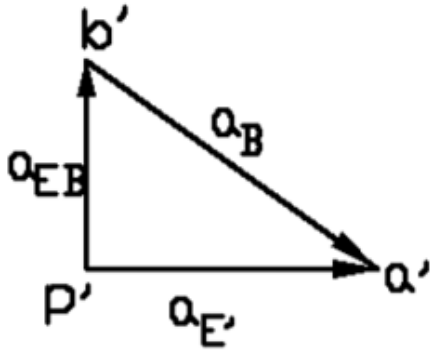

Figure 3. Acceleration analysis chart

$a_{E'} = a^n_B + a^t_B + a^n_{E'B} + a^t_{E'B}$.

$a^t_B = 0, a^n_{E'B} = 0$, $a^n_B = \omega_2{}^2 \times AB = 1.05^2 \times 0.072 = 0.08 m/s$.

aE'=0.00105×p'a'=0.00105×83=0.073m/s2.

3. Conclusion

Feeder is common transport machinery in the field of engineering transportation. You can carry any kind of transmission line, without you cannot think, and can carry out space transportation, transmission lines are always fixed. The feeder has a certain transport capacity, can be transported in a long distance and can carry out a lot of processing technology in the process of transportation, so it is widely used and will gradually spread to the fields needed. It is made up of several important parts, namely the power part, the V belt device, the reducer, the transmission device and the chassis.

We must cultivate good working habits. We must set up a serious, meticulous, meticulous research and keep improving. In the design process, we should take the initiative to think about problems, seriously analyze problems, and actively solve problems.

Because of my limited knowledge and failure to integrate many advanced things into the design, it is also a flaw in this design. I hope that more intelligent things can be integrated into the design after continuous study and effort.

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