Three Dimensional Modeling of Micro Motion Clamping Mechanism

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Abstract

With the popularity of the computer system and the development of the parametric technology and feature modeling technology, computer aided design is known gradually, based on NX a new generation of digital, virtualization, intelligent design platform and assembly technology, the micro clamping mechanism design. Microdynamic mechanism generally refers to the displacement mechanism of the range of the range of a millimeter, displacement resolution and location accuracy of the nanometre grade (even sub-nano-level). Its working principle is: turning handwheel, can make the guide lever move around, make microdynamic adjustment. The graduation design is to use in the form of NX output file, using A360Viewer, WebStorm for web design, in the form of web building micro clamping mechanism of 3 d dynamic model library, for online preview for everybody to refer to research.

Keywords

NX, A360Viewer, WebStorm, microdynamic clamp mechanism, 3d model.

1. Fretting Clamping Mechanism

The micro-motion clamping mechanism mainly realizes the micro-motion of the guide rod through the handwheel, guide sleeve, guide rod, shaft sleeve and other parts, thus realizing the micro-motion of the mechanism and realizing better machining.

Working principle: Micromachineries generally refer to displacement mechanisms with millimeter travel range, displacement resolution and positioning accuracy up to nanometer (or even sub-nanometer) level. Its working principle is that rotating the handwheel can make the guide rod move around and adjust the micro motion.

Micromanipulator is a kind of mechanism which can move to a given position accurately and trace within a certain range or realize a specific feed motion. Application: In Mechatronics products, it is generally used to accurately and micro-adjust the relative position of some components. For example, in the reading system of the instrument, the zero position of the scale is adjusted by the micro-motion mechanism; in the grinder, the screw micro-motion is used.

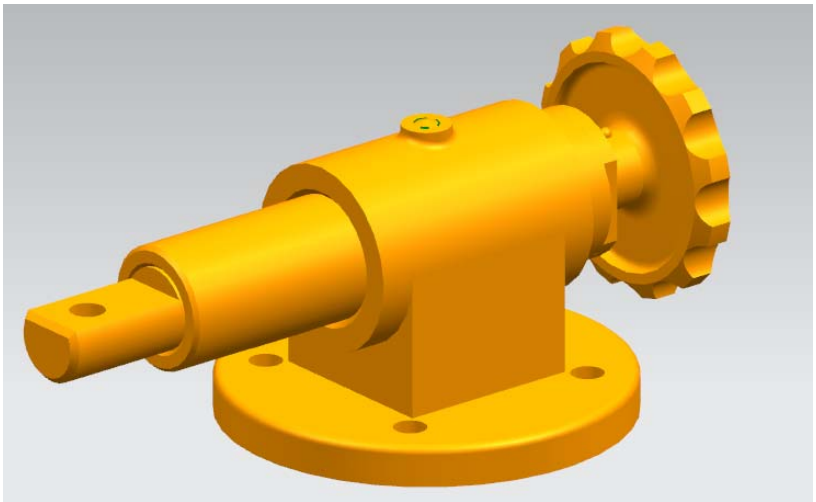

Fig 1. Schematic diagram

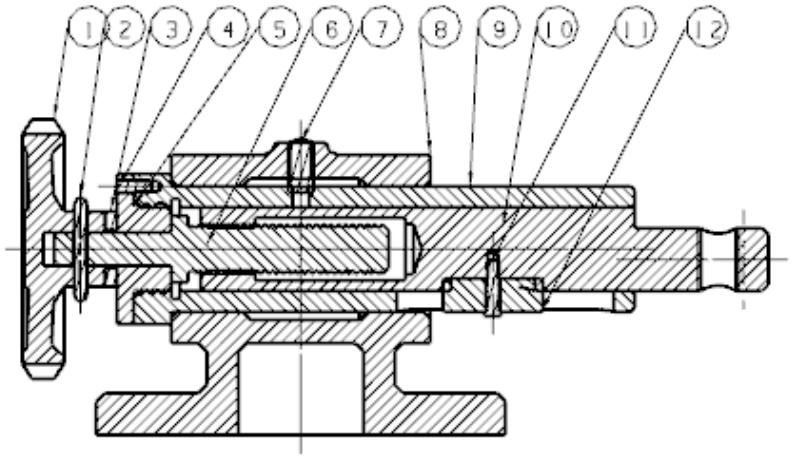

Fig 2. Structure chart

2. Fretting Clamping Mechanism

2.1. Fretting Clamping Mechanism

The basic requirements of fretting clamping mechanism are as follows:

(1) high sensitivity and minimum movement to meet the requirements.

(2) the transmission is flexible and stable, and there is no space and crawling. After braking, it can maintain a stable position.

(3) strong anti-interference ability and quick response.

(4) good structure and manufacturability.

2.2. Micrograpping Clamping Mechanism Design Should Meet The Requirements

(1) The designed product must meet all users' actual requirements.

(2) On the premise of guaranteeing practical use, the products designed should be the most economical (such as type selection, materials, etc.).

(3) how to achieve the comprehensive performance of fretting clamping is the first principle of designers.

(4) Do as many tests as possible for design products to obtain performance parameters as design basis.

2.3. Fretting Clamping Mechanism

(1) The advance of the fretting clamping mechanism is mainly driven by the screw, and the speed of the screw needs to be calculated.

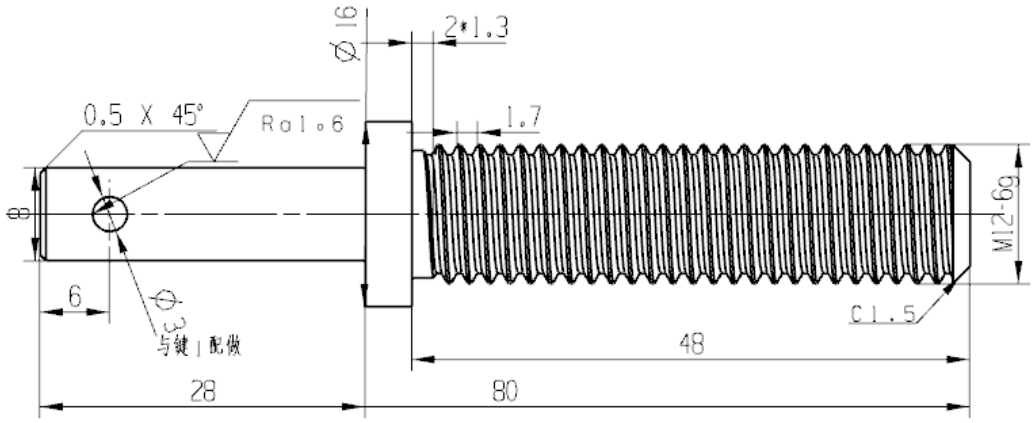

Fig 3. Screw engineering drawing

Pitch of screw: P=1.7mm
Screw turn to circle distance:S=N×P (4.1)
Suppose N is:0.5/s
S=0.5×1.7=0.85mm
(2) The front end of the guide bar needs to be installed to calculate the maximum torque

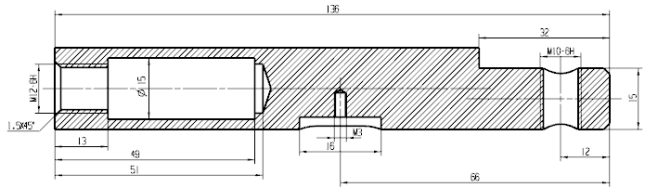

Fig 4. Engineering drawing of guide bar

If the front weight is G=100N
The distance isL=20mm
The torque isF=G×L (5.2)
F=100×20=2000N.mm
F=100×20=2000N.mm

3. Assembly of Fretting Clamping Mechanism

(1) Open NX8.0, click New, select the assembly mode, and select the path to save, enter the file name, and click OK.
(2) choose to add components, first choose the support as a component and ent
(3) Select add component, guide sleeve is component 2, enter as shown in Figure 5, through automatic judgment of the central axis, contact constraints, as shown in Figure 6.

Figure 5. Function diagram

Figure 6. Function diagram

(4) Click OK to form the following effect diagram as shown in Figure 7.

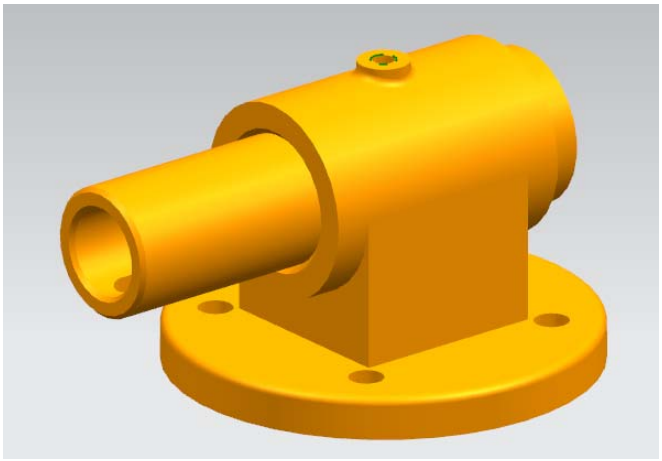

Figure 7. Effect drawing

(5) Add components, select the axle sleeve as component 3, click OK, by automatically judging the constraints of the central axis, and contact constraints, click OK. The effect is shown in Figure 8.

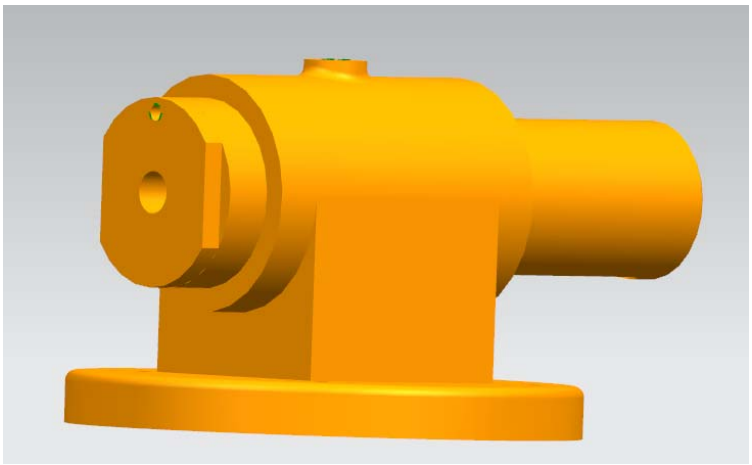

Figure 8. Effect drawing

(6) By adding component screw and guide rod, the assembly can be realized by automatically judging the central axis, contact and distance constraints. The effect is shown in Figure 9.

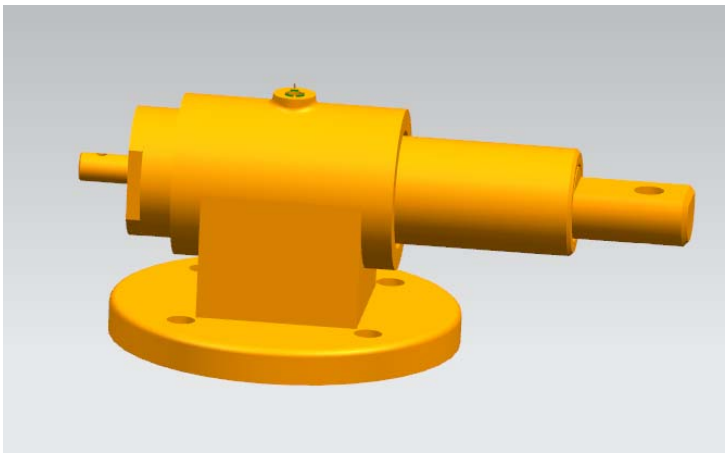

Figure 9. Effect drawing

(7) Add component handwheel, screw, screw and other components, and finally form the effect map, as shown in Figure 10 below.

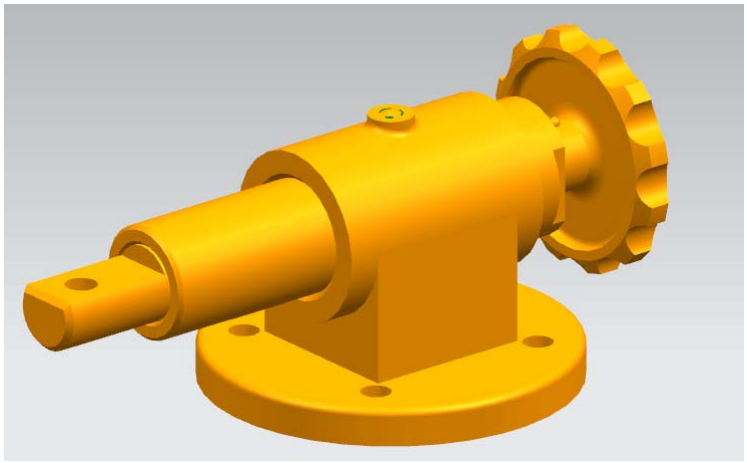

Figure 10. Effect drawing

4. Common Failures and Handling Methods of Fretting Clamping Mechanism

Fretting clamping mechanism in the use of the process, because of manufacturing, transportation, and installation is not in place, or long-term use caused by fatigue damage, resulting in safety valve failure, if not eliminated in time, will cause screw failure, system capacity decline, or even can not play a protective role. Common faults are:

(1) thread looseness results in inaccurate positioning of the guide bar, resulting in problems in the quality of various products.

Remove the screw and guide sleeve, study the damage degree of the screw and guide sleeve, and replace the screw or guide sleeve.

(2) the rotation of the axle sleeve will cause an inaccurate micro movement of the handwheel, resulting in inaccurate positioning. Check whether the locating screws of the axle sleeve are fastened, tighten screws or replace screws.

(3) Handwheel rotation is more difficult to check whether the thread rust or produce dislocation, rust removal work, correct the position of the thread

5. Conclusion

The parts of fretting clamping mechanism are drawn by using NX8.0 and the virtual assembly is carried out. The results show that the design process has the characteristics of visualization, rapid generation of model, accurate virtual assembly, direct editing of parts in assembly, direct mechanical and kinematic analysis of models, and greatly simplifies the traditional design. The complex work and the optimization design can be completed before the actual product is manufactured, which greatly saves the cost and reduces the waste of resources.

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