

CLAMPING JAWS WITH SENSORY EQUIPMENT FOR INTELLIGENT FIXTURE

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Abstract: At this time is coming big expansion and innovation in all development area of technologies and technological devices. Probably industrial robots, manipulators and intelligent fixture belong to development, too. Intelligent fixture with automatic jaws exchange is new vision in intelligent manufacturing. Different types of sensors acquire information on the presence of clamped part in the fixture and evaluate the jaws applicability. In this article we address the proposal to upgrade intelligent sensors used the jaws of our institute.

Key words: Fixture, jaw, gripper, assembly, sensor

1. INTRODUCTION

The trend of new generations of production machines and manufacturing systems required to be equipped with a proper clamping device. Therefore of fixtures evolved and developed simultaneously with machine tools, to avoid reducing their production capacity, timing and power use. Shall also apply in the manufacture of high repeatability batches, but are designed primarily for the small batch production and for complex work pieces clamping. Intelligent fixtures are not only different from traditional by design, but mainly by their properties. Their evolution is clearly linked to the development and implementation of machinery of the higher generations.

For some top of manufacturers clamping tool for machining the emergence of new design solutions, cell complex flexible clamps of devices. Such devices could be called as intelligent fixtures. Their intelligence is that such fixtures are equipped with various types sensors. These evaluated the presence of parts in clamping fixture, its shape and size. On this basis, evaluates the use of different types of clamping jaws, suitable for the restrained parts. Solution this issue is very difficult and costly, and often there is some reduction in the production cycle. Manufacturers now provide its dedicated flexible clamping of the various systems of the size production.

2. CLAMPING JAWS FOR INTELLIGENT FIXTURE

In the context of an emerging effort by automating and streamlining production, improving the competitiveness of manufacturers is constantly looking for ways how to make shorter the development and construction activities. Accordingly, it is important for these activities to choose an appropriate tool - a tool for simulation and process simulation of various assemblies, components (Charbulová & Mudriková, 2009). One possibility is the CATIA V5R15 software, enabling modelling of the entire production system and groups as well as the production process. At our institute, this means - a tool for streamlining, using the detection of collisions, defects and downtime in advance.

The Institute of Production Systems and Applied Mechanics are deal with solution an intelligent clamp for automatic exchange of jaws. The initial solution was created idea for a specific clamp modelled in CATIA software Fig.1.

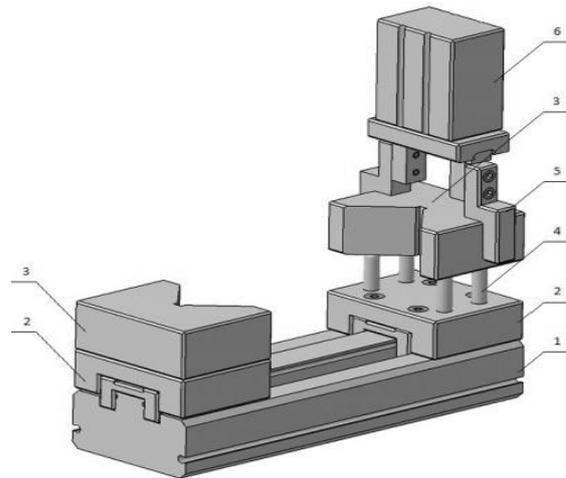


Fig. 1. Intelligent pneumatic fixture:
 1- body of clamping fixture, 2- clamping jig holder,
 3- prismatic jaws, 4- pins, 5- gripper jaws, 6- tentacle

Based on the input parameters fixture was designed buffer exchange jaws. The buffer is for a 5 pairs of jaws. Their shape and dimensions are designed for rotating and non-rotating parts (Košťál & Hrušková, 2009).

The shapes of jaws are:

- flat (non-rotating parts),
- prismatic (rotating parts).

The proposal is considered to clamping of different size variants of components, therefore are different size of prismatic jaws. As can be seen from Fig.2 the buffer of jaws is equipped with different types of jaws. Three pairs of jaws are prismatic variations in size $D_{\min} = 8 \text{ mm}$, $D_{\min} = 25 \text{ mm}$, $D_{\min} = 30 \text{ mm}$ and a pair of flat jaws (Matúšová & Javorová, 2008).

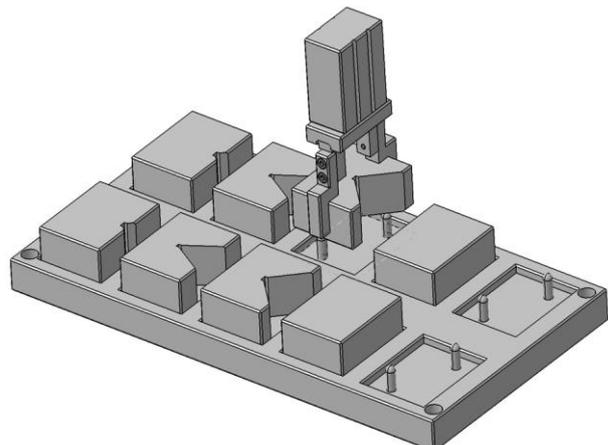


Fig. 2. Buffer of jaws

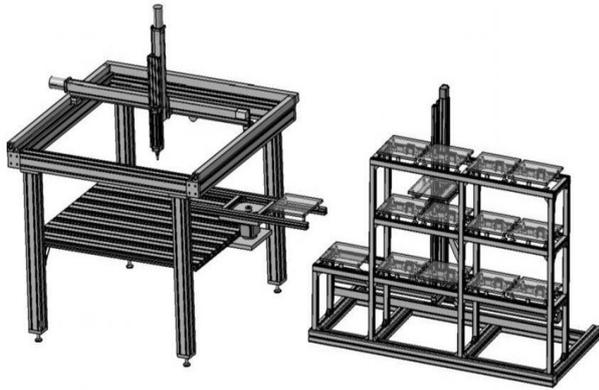


Fig. 3. Intelligent assembly cell

On the Fig. 2 can you see free space in buffer of jaws for a pair of jaws, which is used in the intelligent fixture. In the empty places are seen centering pins that determine the correct position and orientation of the jaws. The jaws are properly installed (location, orientation) with the help of pins, which are the same as of the buffer. The buffer and intelligent fixture will be mounted in the work place an intelligent assembly system Fig.3, which we have in our institute (Ružarovský et al., 2008).

The exchange jaws between the buffer of jaws and intelligent pneumatic fixture provide gripper of the cartesian robot. The gripper takes of one jaw of the buffer of jaws Fig.2 and mounted it on the clamping jig holder in correct position with the help of start-up pins. This procedure is repeated for the other jaw of that pair, but the mirror. Disassembly the jaws made in the same way.

3. SENSORY EQUIPMENT INTELLIGENT FIXTURE

The idea proposal was necessary to extend the sensory equipment of an intelligent fixture. These sensors ensure proper selection jaws, identification of parts and that clamping component is properly oriented in the intelligent pneumatic fixture (Danišová & Velíšek, 2009).

Pneumatic fixture is situated at the working space of industrial robot and is used for clamping of various types objects. For the intelligent fixture were designed individual sensors:

The first used is optical sensor SOEG-RTH-M18-PS-K 2L (sensor of parts identification at the pneumatic fixture).

The second used is electric microswitch S- 3-BE-SW (sensor of jaws identification at the intelligent fixture)

The third is magnetic sensors DM9-BL (sensors of open position for jaws in the intelligent fixture).

The fourth used is pressure sensor PSE510-M5 (sensor for power control of clamping).

On the Fig. 4 is intelligent pneumatic fixture.

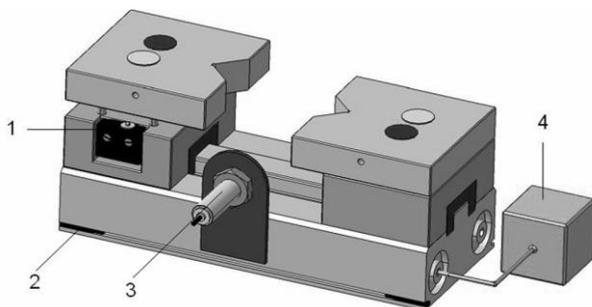


Fig. 4. Intelligent pneumatic fixture with sensors: 1- electric micro switch, 2- magnetic sensor, 3- optical sensor, 4- pressure sensor

4. CONCLUSION

In last time it is required the high accent to technical development in all industry and production areas. The development in production and automation production in industry is very quickly. The basic objective of improving and increasing the efficiency of flexible manufacturing - assembly cell is the continuing expansion peripherals. Among the prominent support of extending the intelligence of the system include various sensors, switches and so forth. The new trend of flexible systems is used various exchange periphery. One possibility is the use of intelligent fixture systems whit automatic exchange jaws. Intelligent fixture systems can assist in increasing reliability of some operations. Sensors will scan jaws presence, product presence, jaws placement and also clamping force regulation. In terms of small size of pneumatic fixture all designed devices are small and we have chosen small sensors. These types of systems are generally extension input / output elements such as various sensors and control units. Originally designed pneumatic fixture was extended of intelligent elements, thereby increasing of the effectiveness of clamping parts. Fixture using intelligent sensors began to distinguish individual shapes of components and thus the appropriate choice of jaws from buffer. Sensor equipment was selected following information, about the communication and signal transmission.

5. ACKNOWLEDGMENTS

This paper for created thanks to national project named **VEGA 1/0163/10 Fixture devices in intelligent manufacturing systems.**

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