

Design and Implementation of Polishing and Polishing Flexible Workstation Based on Industrial Robot

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Abstract

In recent years, with the continuous development of intelligent manufacturing industry, the application field of robot is more and more extensive, which provides favorable conditions for the application of robot in the field of complex surface polishing. The polishing and polishing flexible robot workstation designed in this paper, centered on ABB industrial robot IRB2600, is equipped with a robot hand grip, which is responsible for grasping, changing direction, polishing and recycling polishing workpieces. The production line is also equipped with a material tray conveying device, a polishing mechanical device, a cloth wheel and a hemp wheel, etc. The robot workstation has reasonable layout, good structure design and stable operation, which greatly improves the efficiency of workpiece polishing and grinding, and has a high level of flexibility and automation.

Keywords

Hardware work piece ; Polishing and polishing; Industrial Robot.

1. Introduction

Sanitary ware, valve, tableware, auto parts and other products have high requirements for surface quality. In these basic industrial manufacturing industries, polishing technology is needed for surface treatment. Polishing can not only improve the dimensional accuracy or geometric accuracy of the workpiece, but also for the purpose of obtaining smooth surface or mirror gloss[1-3].

In recent years, with the continuous development of intelligent manufacturing industry, the application field of robot is more and more extensive, which provides favorable conditions for the application of robot in the field of complex surface polishing. Because the robot's manipulator is flexible and diverse, through the analysis and experiment of the workers' movements, the grinding process parameters are extracted, and the robot is programmed to control, which can simulate the workers' movements, so as to achieve the purpose of replacing human. The application of robot in the automatic polishing of complex curved surface parts can not only greatly improve the working efficiency, but also ensure the machining accuracy of the workpiece, and also make the working environment of workers have a qualitative leap. Therefore, robot polishing has the advantages of high efficiency, high yield, product consistency, labor cost reduction, labor intensity reduction and working environment improvement[4-6].

Because of these advantages of robot polishing, the research on automatic polishing of complex free-form surface parts with industrial machines in basic industry has important academic value and practical significance. The polishing and polishing workstation designed in this paper is based on industrial robots instead of manual work. It is not only highly automated, but also adaptable to bathroom and handle polishing, with strong flexibility. In order to design a reasonable and better

industrial robot production line, the overall layout of polishing and polishing of industrial robot, the design and debugging of main components are carried out based on hardware such as door handle.

2. System structure and layout design of polishing robot workstation

2.1 The system structure of polishing workstation

The system of polishing robot workstation consists of industrial robot, polishing machine system, control system and material tray. As shown in Figure 1, the industrial robot technology, three-dimensional modeling technology and fixture design are used to design the polishing workstation, so as to realize the replacement of polishing machine and intelligent production.

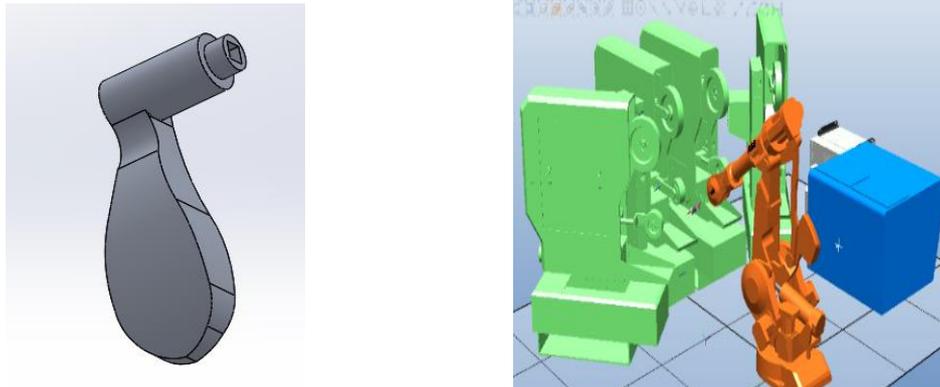


Fig. 1 Polishing and polishing and workstation

2.2 layout and process design of polishing workstation

Due to the complex curved surface of the door handle and other hardware workpieces and the tedious manual grinding, the layout design of the polishing and grinding workstation is carried out according to the process flow, as shown in Figure 2, with the industrial robot as the main body, the grasping action, polishing and grinding, dust treatment and other work tasks of the door handle and other processed workpieces are completed. The process design of polishing and grinding is as follows:

- (1) In the material tray, the workpiece is manually placed in the fixture to complete the loading and conveying of the workpiece;
- (2) The robot can grasp, change direction and carry the workpiece;
- (3) The polishing machine cooperates with the robot to finish the workpiece continuously;
- (4) The robot grabs the workpiece for dust treatment at the hemp wheel and cloth wheel;
- (5) Finally, put the processed workpiece back to the material tray, and then continue to grab the workpiece for recycling until the material tray is fully processed, and then transfer the workpiece for blanking.

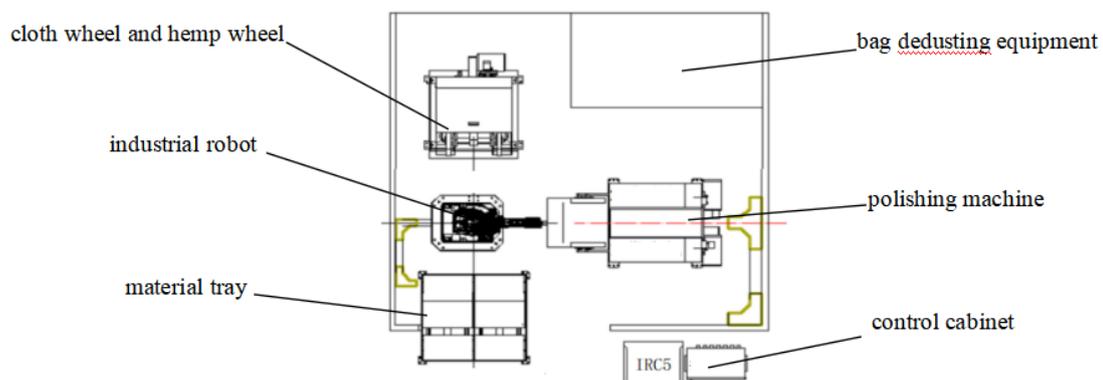


Fig. 2 Layout design of polishing workstation

3. The design of functional parts of polishing and polishing workstation

The polishing and polishing flexible workstation is based on the industrial robot as the working core, which cooperates with the customized grab, polishing machine and material plate to complete the loading, positioning, dust treatment and other work of the door handle and other workpieces. According to the requirements of output, beat, load and other factors, and considering the layout, cost and other factors, the scheme selects ABB Robot irb2600 industrial robot.

3.1 Structure design of the conveying device of the material tray

The feeding tray conveying device is composed of feeding rack, linear guide rail, air cylinder, product feeding tray, protective cover, pressure switch and air tank, as shown in Figure 3:

- (1) The left side is 2 # material tray and the right side is 1 # material tray : it can be operated through the buttons on the control cabinet.
- (2) There is an air tank in it to provide the total air supply for the whole set of equipment.
- (3) The operation of 1 # material tray and 2 #material tray is driven by two cylinder cylinders at the bottom of the material table.

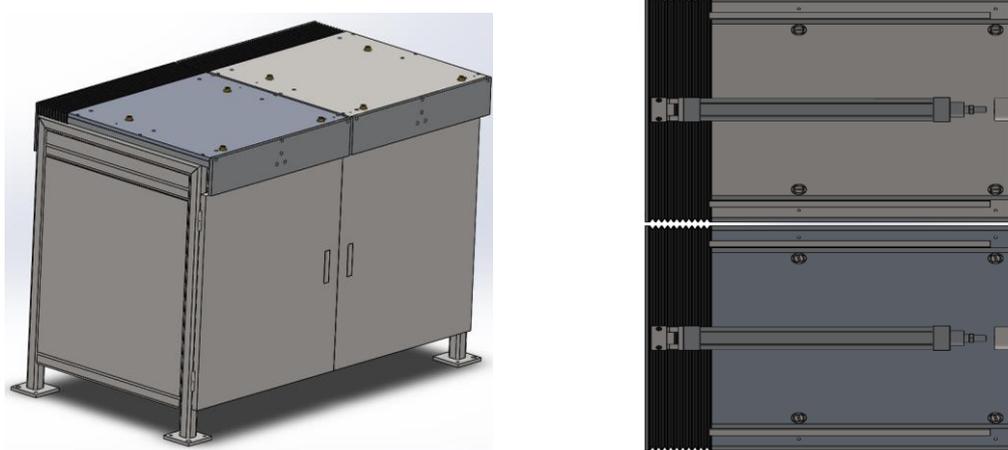


Fig.3 Tray conveyor and internal cylinder structure

The material tray is placed on the top of the conveying device, and a positioning guide groove is arranged in the design to realize the positioning of the workpiece. As shown in Figure 4, the material tray has two rows of positioning slots matching the door handle, and the industrial robot can grab the door handle from the material tray in a certain order. Different product plates can be replaced on the discharging shelf. Through the system and robot signal, human-computer interaction, the robot can be provided with product taking and placing, and the product can be replaced manually.

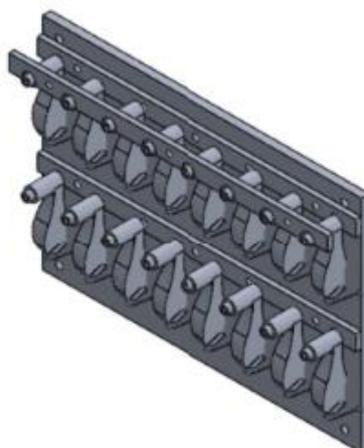


Fig.4 Material tray for door handle hardware

3.2 structure design of polishing device

The belt sander, as shown in Figure 5, is composed of frame base, belt tightening mechanism, belt deviation rectifying mechanism, wheel frame constant pressure mechanism, wheel frame mounting arm, polishing wheel, belt, air cylinder, pressure regulating valve, driving motor, driving rubber wheel, belt pulley, protective cover, etc.

The polishing machine can be equipped with two abrasive belts of different width, specifications and sizes, and can also increase the drawing wheel of auxiliary wheel or the mechanism of bonded sand cloth wheel. The two active motors provide power source for the upper and lower polishing wheels respectively. The belt is rotated through the driving wheel belt mechanism to achieve the purpose of polishing. The belt center offset can be adjusted by the belt rectifying mechanism.

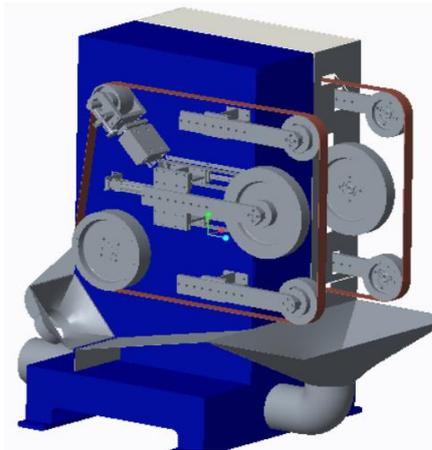


Fig. 5 Structure diagram of polishing device

3.3 Design of hand grip for polishing robot

The hand grip of polishing robot consists of clamp connecting seat, rotary cylinder, two side mounting plates, two side connecting plates, frame mounting seat, clamp mechanism, air pipe and joint, etc. In order to solve the complex structure of the polishing product, each part of the product can be polished. The rotary cylinder is used to provide the air source from the five way two position cylinder to realize the 0-90 ° displacement, as shown in Figure 6. The polishing action is automatically completed by combining the robot arm, control system and belt sander.

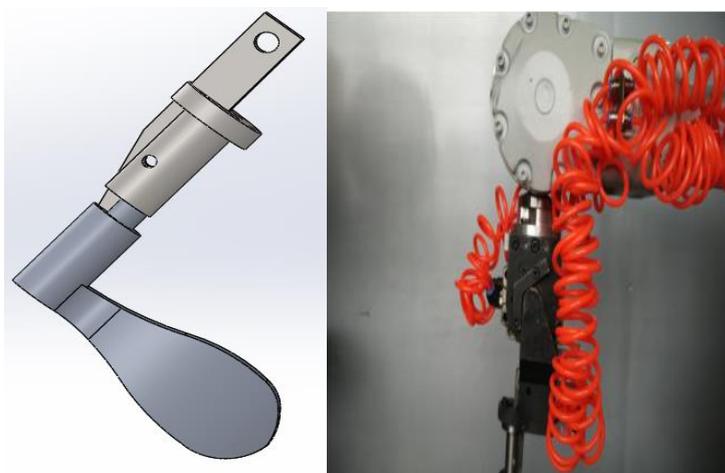


Fig. 6 Polishing and polishing customized grab

3.4 Debugging and operation of polishing workstation

As shown in Figure 7, the polishing and polishing flexible industrial robot workstation takes the door handle as the grab object and is placed in two material trays in the form of 2x8. When working, the industrial robot quickly grasps the door handle by pneumatic hand for polishing and polishing. The whole process has high working efficiency, the whole polishing and polishing flexible workstation works quickly, runs stably and meets the production requirements.



Fig. 7 Polishing and grinding workstation

4. Conclusion

The polishing and polishing workstation designed in this paper adopts the automation technology and takes the industrial robot as the center. It designs the main components such as robot hand grip, material tray conveying device, polishing device and workpiece grab, and finally completes the functions of grasping, reversing and polishing the door handle. The layout of the polishing and grinding workstation of the industrial robot is reasonable and applicable, which greatly saves the labor cost and improves the working efficiency. The practical application shows that the whole polishing workstation runs well, its working speed is stable, it has high flexibility, and it has high promotion and application value.

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