

外文出处:《Manufacturing Engineering and Technology—Machining》

Manipulator

Robot developed in recent decades as high-tech automated production equipment. Industrial robot is an important branch of industrial robots. It features can be programmed to perform tasks in a variety of expectations, in both structure and performance advantages of their own people and machines, in particular, reflects the people's intelligence and adaptability. The accuracy of robot operations and a variety of environments the ability to complete the work in the field of national economy and there are broad prospects for development. With the development of industrial automation, there has been CNC machining center, it is in reducing labor intensity, while greatly improved labor productivity. However, the upper and lower common in CNC machining processes material, usually still use manual or traditional relay-controlled semi-automatic device. The former time-consuming and labor intensive, inefficient; the latter due to design complexity, require more relays, wiring complexity, vulnerability to body vibration interference, while the existence of poor reliability, fault more maintenance problems and other issues. Programmable Logic Controller PLC-controlled robot control system for materials up and down movement is simple, circuit design is reasonable, with a strong anti-jamming capability, ensuring the system's reliability, reduced maintenance rate, and improve work efficiency. Robot technology related to mechanics, mechanics, electrical hydraulic technology, automatic control technology, sensor technology and computer technology and other fields of science, is a cross-disciplinary integrated technology.

First, an overview of industrial manipulator

Robot is a kind of positioning control can be automated and can be re-programmed to change in multi-functional machine, which has multiple degrees of freedom can be used to carry an object in order to complete the work in different environments. Low wages in China, plastic products

industry, although still a labor-intensive, mechanical hand use has become increasingly popular. Electronics and automotive industries that Europe and the United States multinational companies very early in their factories in China, the introduction of automated production. But now the changes are those found in industrial-intensive South China, East China's coastal areas, local plastic processing plants have also emerged in mechanical watches began to become increasingly interested in, because they have to face a high turnover rate of workers, as well as for the workers to pay work-related injuries fee challenges.

With the rapid development of China's industrial production, especially the reform and opening up after the rapid increase in the degree of automation to achieve the workpiece handling, steering, transmission or operation of brazing, spray gun, wrenches and other tools for processing and assembly operations since, which has more and more attracted our attention.

Robot is to imitate the manual part of the action, according to a given program, track and requirements for automatic capture, handling or operation of the automatic mechanical devices.

In real life, you will find this a problem. In the machine shop, the processing of parts loading time is not annoying, and labor productivity is not high, the cost of production major, and sometimes man-made incidents will occur, resulting in processing were injured. Think about what could replace it with the processing time of a tour as long as there are a few people, and can operate 24 hours saturated human right? The answer is yes, but the robot can come to replace it.

Production of mechanical hand can increase the automation level of production and labor productivity; can reduce labor intensity, ensuring product quality, to achieve safe production; particularly in the high-temperature, high pressure, low temperature, low pressure, dust, explosive, toxic and radioactive gases such as poor environment can replace the normal working people. Here I would like to think of designing a robot

to be used in actual production.

Why would a robot designed to provide a pneumatic power: pneumatic robot refers to the compressed air as power source-driven robot. With pressure-driven and other energy-driven comparison have the following advantages: 1. Air inexhaustible, used later discharged into the atmosphere, does not require recycling and disposal, do not pollute the environment. (Concept of environmental protection) 2. Air stick is small, the pipeline pressure loss is small (typically less than asphalt gas path pressure drop of one-thousandth), to facilitate long-distance transport. 3. Compressed air of the working pressure is low (usually 4 to 8 kg / per square centimeter), and therefore moving the material components and manufacturing accuracy requirements can be lowered. 4. With the hydraulic transmission, compared to its faster action and reaction, which is one of the advantages pneumatic outstanding. 5. The air cleaner media, it will not degenerate, not easy to plug the pipeline. But there are also places where it fly in the ointment: 1. As the compressibility of air, resulting in poor aerodynamic stability of the work, resulting in the implementing agencies as the precision of the velocity and not easily controlled. 2. As the use of low atmospheric pressure, the output power can not be too large; in order to increase the output power is bound to the structure of the entire pneumatic system size increased.

With pneumatic drive and compare with other energy sources drive has the following advantages:

Air inexhaustible, used later discharged into the atmosphere, without recycling and disposal, do not pollute the environment. Accidental or a small amount of leakage would not be a serious impact on production.

Viscosity of air is small, the pipeline pressure loss also is very small, easy long-distance transport.

The lower working pressure of compressed air, pneumatic components and therefore the material and manufacturing accuracy requirements can be lowered. In general, reciprocating thrust in 1 to 2 tons pneumatic economy

is better.

Compared with the hydraulic transmission, and its faster action and reaction, which is one of the outstanding merits of pneumatic.

Clean air medium, it will not degenerate, not easy to plug the pipeline.

It can be safely used in flammable, explosive and the dust big occasions.

Also easy to realize automatic overload protection.

Second, the composition, mechanical hand

Robot in the form of a variety of forms, some relatively simple, some more complicated, but the basic form is the same as the composition of the , Usually by the implementing agencies, transmission systems, control systems and auxiliary devices composed.

1. Implementing agencies

Manipulator executing agency by the hands, wrists, arms, pillars. Hands are crawling institutions, is used to clamp and release the workpiece, and similar to human fingers, to complete the staffing of similar actions. Wrist and fingers and the arm connecting the components can be up and down, left, and rotary movement. A simple mechanical hand can not wrist. Pillars used to support the arm can also be made mobile as needed.

2. Transmission

The actuator to be achieved by the transmission system. Sub-transmission system commonly used manipulator mechanical transmission, hydraulic transmission, pneumatic and electric power transmission and other drive several forms.

3. Control System

Manipulator control system's main role is to control the robot according to certain procedures, direction, position, speed of action, a simple mechanical hand is generally not set up a dedicated control system, using only trip switches, relays, control valves and circuits can be achieved dynamic drive system control, so that implementing agencies according to the requirements of action. Action will have to use complex programmable

robot controller, the micro-computer control.

Three, mechanical hand classification and characteristics

Robots are generally divided into three categories: the first is the general machinery does not require manual hand. It is an independent not affiliated with a particular host device. It can be programmed according to the needs of the task to complete the operation of the provisions. It is characterized with ordinary mechanical performance, also has general machinery, memory, intelligence ternary machinery. The second category is the need to manually do it, called the operation of aircraft. It originated in the atom, military industry, first through the operation of machines to complete a particular job, and later developed to operate using radio signals to carry out detecting machines such as the Moon. Used in industrial manipulator also fall into this category. The third category is dedicated manipulator, the main subsidiary of the automatic machines or automatic lines, to solve the machine up and down the workpiece material and delivery. This mechanical hand in foreign countries known as the "Mechanical Hand", which is the host of services, from the host-driven; exception of a few outside the working procedures are generally fixed, and therefore special.

Main features:

First, mechanical hand (the upper and lower material robot, assembly robot, handling robot, stacking robot, help robot, vacuum handling machines, vacuum suction crane, labor-saving spreader, pneumatic balancer, etc.).

Second, cantilever cranes (cantilever crane, electric chain hoist crane, air balance the hanging, etc.)

Third, rail-type transport system (hanging rail, light rail, single girder cranes, double-beam crane)

Four, industrial machinery, application of hand

Manipulator in the mechanization and automation of the production process developed a new type of device. In recent years, as electronic technology, especially computer extensive use of robot development and production of

high-tech fields has become a rapidly developed a new technology, which further promoted the development of robot, allowing robot to better achieved with the combination of mechanization and automation.

Although the robot is not as flexible as staff, but it has to the continuous duplication of work and labor, I do not know fatigue, not afraid of danger, the power snatch weight characteristics when compared with manual large, therefore, mechanical hand has been of great importance to many sectors, and increasingly has been applied widely, for example:

(1) Machining the workpiece loading and unloading, especially in the automatic lathe, combination machine tool use is more common.

(2) In the assembly operations are widely used in the electronics industry, it can be used to assemble printed circuit boards, in the machinery industry It can be used to assemble parts and components.

(3) The working conditions may be poor, monotonous, repetitive easy to sub-fatigue working environment to replace human labor.

(4) May be in dangerous situations, such as military goods handling, dangerous goods and hazardous materials removal and so on.

(5) Universe and ocean development.

(6), military engineering and biomedical research and testing.

Help mechanical hands: also known as the balancer, balance suspended, labor-saving spreader, manual Transfer machine is a kind of weightlessness of manual load system, a novel, time-saving technology for material handling operations booster equipment, belonging to kinds of non-standard design of series products. Customer application needs, creating customized cases. Manual operation of a simulation of the automatic machinery, it can be a fixed program draws , handling objects or perform household tools to accomplish certain specific actions. Application of robot can replace the people engaged in monotonous , repetitive or heavy manual labor, the mechanization and automation of production, instead of people in hazardous environments manual operation, improving working conditions and ensure

personal safety. The late 20th century, 40, the United States atomic energy experiments, the first use of radioactive material handling robot, human robot in a safe room to manipulate various operations and experimentation. 50 years later, manipulator and gradually extended to industrial production sector, for the temperatures, polluted areas, and loading and unloading to take place the work piece material, but also as an auxiliary device in automatic machine tools, machine tools, automatic production lines and processing center applications, the completion of the upper and lower material, or From the library take place knife knife and so on according to fixed procedures for the replacement operation. Robot body mainly by the hand and sports institutions. Agencies with the use of hands and operation of objects of different occasions, often there are clamping , support and adsorption type of care. Movement organs are generally hydraulic pneumatic , , electrical device drivers. Manipulator can be achieved independently retractable , rotation and lifting movements, generally 2 to 3 degrees of freedom. Robots are widely used in metallurgical industry, machinery manufacture, light industry and atomic energy sectors.

Can mimic some of the staff and arm motor function, a fixed procedure for the capture, handling objects or operating tools, automatic operation device. It can replace human labor in order to achieve the production of heavy mechanization and automation that can operate in hazardous environments to protect the personal safety, which is widely used in machinery manufacturing, metallurgy, electronics, light industry and nuclear power sectors. Mechanical hand tools or other equipment commonly used for additional devices, such as the automatic machines or automatic production line handling and transmission of the workpiece, the replacement of cutting tools in machining centers, etc. generally do not have a separate control device. Some operating devices require direct manipulation by humans; such as the atomic energy sector performs household hazardous materials used in the master-slave manipulator is also often referred to as mechanical hand.

Manipulator mainly by hand and sports institutions. Task of hand is holding the workpiece (or tool) components, according to grasping objects by shape, size, weight, material and operational requirements of a variety of structural forms, such as clamp type, type and adsorption-based care such as holding. Sports organizations, so that the completion of a variety of hand rotation (swing), mobile or compound movements to achieve the required action, to change the location of objects by grasping and posture.

Robot is the automated production of a kind used in the process of crawling and moving piece features automatic device, which is mechanized and automated production process developed a new type of device. In recent years, as electronic technology, especially computer extensive use of robot development and production of high-tech fields has become a rapidly developed a new technology, which further promoted the development of robot, allowing robot to better achieved with the combination of mechanization and automation. Robot can replace humans completed the risk of duplication of boring work, to reduce human labor intensity and improve labor productivity. Manipulator has been applied more and more widely, in the machinery industry, it can be used for parts assembly, work piece handling, loading and unloading, particularly in the automation of CNC machine tools, modular machine tools more commonly used. At present, the robot has developed into a FMS flexible manufacturing systems and flexible manufacturing cell in an important component of the FMC. The machine tool equipment and machinery in hand together constitute a flexible manufacturing system or a flexible manufacturing cell, it was adapted to small and medium volume production, you can save a huge amount of the work piece conveyor device, compact, and adaptable. When the work piece changes, flexible production system is very easy to change will help enterprises to continuously update the marketable variety, improve product quality, and better adapt to market competition. At present, China's industrial robot technology and its engineering application level and comparable to foreign countries there is a certain

distance, application and industrialization of the size of the low level of robot research and development of a direct impact on raising the level of automation in China, from the economy, technical considerations are very necessary. Therefore, the study of mechanical hand design is very meaningful.

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S. Carle Puckey ANN (Serope kalpakjian)

S.R Mide (Steven R. Schmid).