
Design of Crawler Type Automatic Feeding Shot Blasting Machine

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Abstract

In the modern industry, when surface cleaning of small and medium-sized castings, forgings, welded parts and welded parts is carried out, most of them are treated by shot blasting. The shot blasting machine is a machine for sand cleaning, descaling, descaling and surface strengthening of materials. The principle is that the workpiece is placed in a closed container, and the projectile is accelerated by a blasting machine, and the accelerated projectile directly hits the workpiece, so that the surface of the casting sand and the scale are cleaned by impact to achieve the cleaning of the workpiece. purpose. During the cleaning process, the impact state of the workpiece surface can be changed by impact, and the fatigue strength is improved. Therefore, the shot blasting process of castings, forgings and welded parts and welded parts is widely used. However, the shot blasting machine used in modern industry has the following two defects: 1. The workpiece needs to be manually added, and the production efficiency is low. 2. The position of the workpiece in the blast chamber cannot be adjusted in all directions relative to the direction in which the projectile is thrown. Therefore, the projectile that is thrown only hits part of the surface of the workpiece, and the portion that cannot be hit is not processed, and the cleaning is not complete. The crawler type automatic feeding shot blasting machine studied in this paper solves the above two defects. This model is widely used due to its good cleaning effect, convenient loading and unloading, and easy automation or semi-automation. When the shot blasting shot is shot, the workpiece is continuously flipped with the positive movement of the track, so that each side of the workpiece is cleaned. The crawler type automatic feeding shot blasting and strengthening machine is a new type of special shot blasting equipment designed according to user requirements. It is used for cleaning and strengthening of castings and forgings and welded parts, small round springs, bearings and other workpieces. The equipment has larger shot blasting capacity, better sealing performance, and has better improvement of cleaning effect, production efficiency and dust removal effect. It can not only remove rust, scale, and molded sand after casting by shot blasting. It can also reduce the internal stress of the workpiece and improve the fatigue strength of the workpiece. In this paper, the innovation of the blasting machine blade is adopted, which adopts the "straight tube type, tubular curved type blade", which reduces the wear amount of the blade and improves the efficiency, prolongs the life and reduces the cost.

Keywords

Shot blasting machine, automatic feeding, cleaning surface, tubular blade.

1. Topic Background

With the rapid development of the machinery manufacturing industry, as the casting of rough, semi-finished products and even finished products is also rapidly entering the development period, how to make the surface cleaning of castings fast and efficient has become a problem for small and

medium-sized enterprises, especially small enterprises. . Because of this, many companies, including research institutes, are constantly researching new methods and processes to meet the casting industry's requirements for surface cleaning of castings, forgings and welded parts.

However, there are two kinds of defects in the shot blasting machine used in modern industry:

1. The workpiece needs to be manually added, and the production efficiency is low.
2. The position of the workpiece in the blast chamber cannot be adjusted in all directions relative to the direction in which the projectile is thrown. Therefore, the projectile that is thrown only hits part of the surface of the workpiece, and the portion that cannot be hit is not processed, and the cleaning is not complete.

This article is based on this defect, designed to achieve mechanization and automated cleaning of castings, forgings and welded parts.

2. Research Status

The development of shot blasting technology, like other industries, has gone through a long period of time from imitation to self-development to rapid legal exhibition.

Before the 1980s, the application of shot blasting technology and the cleaning of small and medium-sized castings. After the 1980s, with the reform and development and the planned economy shifting to the market economy, the demand for shot blasting industry in various industries has become widespread and urgent. Over the years, shot blasting technology and equipment have been perfected, various types of shot blasting machines have emerged continuously, and performance has been continuously improved. The scope of application has expanded from the surface cleaning of the simple foundry industry to metallurgical mines, machinery manufacturing, automobile tractors, weapons manufacturing, and textiles. In different industries such as machinery, ship vehicles, and aerospace, the process range extends from the surface cleaning of castings and forgings to the strengthening of metal structural parts, surface processing, and shot blasting[1].

At this stage, shot blasting technology is mainly oriented towards energy conservation, environmental protection, high efficiency, safety and economic development. Various types of cleaning machines have emerged (such as through-type shot blasting machine, rotary cleaning machine, hook cleaning machine, crawler belt). Type cleaning machine, drum cleaning machine, chain cleaning machine, shot blasting machine, etc.), in the technical development trend is mainly combined with new technologies (such as advanced virtual manufacturing technology, robot technology), the use of new materials (If new materials are used to solve the wear problem, and combined with computer technology (such as software development), the intelligent, electronic and infrared remote control of the shot blasting machine can be realized to achieve full automation[2].

3. Design Tasks

This design takes into account the subsequent development of the product. Based on the extensive investigation and research of the existing shot blasting machine, the problems existing in the existing shot blasting machine are improved. Solve two problems:

1. The workpiece needs to be manually added, and the production efficiency is low.
2. The position of the workpiece in the blast chamber cannot be adjusted in all directions relative to the direction in which the projectile is thrown. Therefore, the projectile that is thrown only hits part of the surface of the workpiece, and the portion that cannot be hit is not processed, and the cleaning is not complete.

4. General Requirements

- 1 Realize mechanization and eliminate the physical and manual labor of sand cleaners.
- 2 can achieve multi-directional cleaning, try to clean the dead ends.

3 using advanced shot blasting technology.

4 The equipment works reliably, the whole machine is low in cost, easy to operate, simple to maintain, and has high production efficiency and labor productivity.

5 Improve the working environment and regulate the degree of pollution of the workplace according to national statutory standards.

5. Organization of the Text

5.1 Track-Type Automatic Feeding Shot Blasting Machine Blasting Machine Design

5.1.1 Composition of Crawler Type Automatic Feeding Shot Blasting Machine

This series of shot blasting machine consists of cleaning room, track rotation, projectile circulation system, shot blasting machine, feeding machine and its electrical structure.

(1) Chamber structure

Since the cleaning device is a crawler type automatic feeding device, the top of the room is subjected to the pulley hook mechanism and the motor, so the rigidity of the chamber body is relatively high, and the channel steel and the I-beam are used as the load-bearing brackets, and then the steel plate is welded. The hot-rolled I-beam and the hot-rolled channel steel are used as the skeleton, and the thickness of the chamber wall and the roof steel plate is 6.5 mm. The place where the blasting machine is installed is supplemented with a 40 mm thick cast iron plate to enhance the shock absorption effect. Steel should be added under the steel plate supporting the blasting machine and the motor base to enhance the local stiffness. In addition, the blasting machine is mounted on a chamber wall having a figure-eight-section steel structure. The height of the section is relatively large and the rigidity is good, so that vibration can be effectively prevented.

To prevent the large amount of dust generated during cleaning or sand cleaning. And to prevent the projectile from flying out and hurting people. To this end, generally on the inner wall of the metal chamber, a layer of rubber shield is also hung. A 30 mm thick rubber guard is used near the pill flow coverage area, and a 10 mm thick rubber shield is used elsewhere in the chamber wall and on the roof. Rubber guards extend metal chamber life and reduce noise[3].

(2) Chamber door structure

The two steel wire ropes respectively pass over the pulleys and are attached to the feeding door to control the driving mechanism of the door to meet the opening and closing requirements of the door. The inner wall of the feeding door is provided with a replaceable wear plate, and the door is provided with a roller to ensure that the door body smoothly opens and closes along the fixed track. Labyrinth seals are provided on each side of the door to minimize leakage of the projectile and to prevent blockages between the door and the seal due to projectiles. A baffle is placed on the inside of the feed door to avoid stacking of the workpiece between the feed gate and the track[4]

(3) Indoor crawler belt

The track is made of splicing of track shoes. The material can be made of low carbon steel or heat treated high manganese steel. The track shoe surface is a flat surface that has not been forged and has a T-shaped cross section to enhance its rigidity. Both ends of the track shoe are connected to the chain ring, the chain ring is made of heat-treated steel, and the chain ring is connected by a steel pin. The drive unit is forced to run by the chain drive. Both ends of the track cavity are provided with end plates made of steel plate, and the inner side of the end plate is provided with a wear plate, and the bearing seat installed outside the chamber wall is sealed and filled with grease to support the end plate. The end plate can be adjusted in various directions.

(4) Feeder

The blades of the blast machine can be divided into linear and curved blades. But these two blades wear fast and have a short life. In order to improve the service life of the blades, we have designed a tubular

blade that uses a highly abrasive alumina projectile for cleaning precision castings. This type of tubular blade made of a highly wear-resistant high-aluminum ceramic material can be used at a different angle after the blade is worn. Its service life is 10-20 times that of ordinary blades, and it achieves higher projectile throwing speed due to the high-speed airflow formed in the pipe.

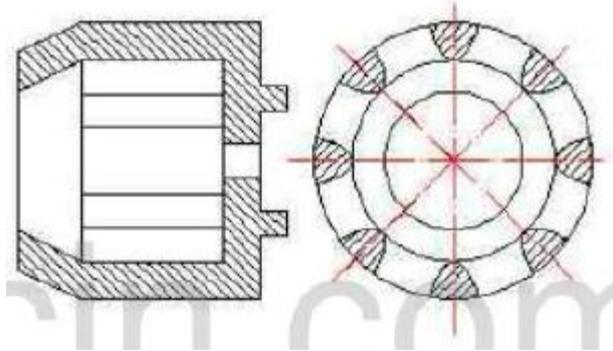


Figure 1. Straight tube blade

(5) Feeder

The feeder consists of a fixed frame, a hopper, a trolley, and a drive unit. The fixed frame is mounted directly in front of the floor roller. The utility model is composed of a channel steel and a reinforced steel plate, and a protective plate is arranged on one side of the bracket, and a control button is arranged on one side thereof, and the bracket supports a swinging rod. When the loading driving device drives, the drum rotates and winds up the steel wire rope, thereby making the hopper The groove rises along the inner groove of the swinging rod, and the swinging rod rotates around the support point, so that the material bucket tends to clean the feeding door during the ascending and rotating, and the material is poured into the drum.

The drive shaft end has a rotary stroke switch, and from the limit end of the limit hopper, a feed end switch gives a signal after the hopper falls, indicating that the action is completed[5].

(6) Control system

The electrical control of the nine-machine is mainly composed of the main circuit and the control circuit. The electrical equipment is mainly: motor, contactor, relay, various buttons and signal lights. The main circuit is powered by AC 380V, and the control circuit is powered by AC 110V[6].

5.1.2 Cleaning Mechanism of Crawler Type Automatic Feeding Shot Blasting Machine

A specified number of workpieces are added to the cleaning chamber. After the machine is started, the projectiles thrown at high speed by the blasting machine form a flow pellet, which is evenly struck on the surface of the workpiece, thereby achieving the purpose of cleaning and strengthening. The thrown projectiles and sand particles flow into the hoist and are lifted by the hoist into the separator for separation. The dust is sucked into the dust collector by the fan, and the clean air is discharged into the atmosphere. The dust on the bag is mechanically beaten and dropped into the dust box at the bottom of the dust collector. The user can periodically remove the waste sand from the waste pipe. Can be reused. The mixture of the shot sand is taken back into the chamber body by the recycling pipe, and is reused after the separator is separated, and the clean projectile is thrown into the blasting machine by the electromagnetic supply ball gate to throw the workpiece.

5.1.3 Features

This machine integrates domestic and foreign technology and is a cleaning device with good cleaning effect, compact structure and low noise. It has the following characteristics:

- 1 The machine adopts a cantilever centrifugal blasting machine, which has the characteristics of long service life and simple structure;
- 2 Suitable for cleaning all kinds of materials, with good cleaning effect.

3The pulleys adopt the internationally advanced quick-change structure, which is beneficial to improve production efficiency and reduce labor intensity.

4Adopting advanced separator, with good separation effect and high productivity, has a positive effect on improving blade life;

5 The use of advanced dust collectors, dust emission concentration is lower than the national standards, improving the working environment of workers[7].

5.1.4 Scope of Application

The crawler shot blasting machine is a specially designed shot blasting machine. It uses a high-speed rotary impeller to throw the projectile onto the workpiece in the chamber to achieve the purpose of cleaning. It is suitable for sand cleaning, descaling, descaling and surface strengthening of small castings, forgings, stampings, gears, springs, etc. It is especially suitable for the cleaning and strengthening of parts that are afraid of collision[8].

6. Conclusion

The development of science and technology has driven the development of the foundry industry. The development of the foundry industry has accelerated the modernization process and promoted the development of society and the improvement of the quality of life. However, the development of science and technology and the improvement of people's living standards have raised the working intensity and working environment of people. Higher requirements. The contradiction between these two aspects prompted people to solve the mechanized cleaning problem of the casting surface.

The currently used shot blasting equipment has defects such as low production efficiency, incomplete cleaning, and short blade life. This paper is studying these three kinds of defects. This article did the following work:

The automatic loading and unloading mechanism is adopted, and at the same time, the work is automatically discharged.

Pipe blades are used to extend service life.

This article also needs to do further work:

1 Optimized design of parts and systems to improve the reliability, operation efficiency and reduce the cost of the whole machine.

2 Research on anti-deformation cleaning technology of thin plate members.

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