

Feasibility Study on Cooling the Main Winch Thruster of Blast Furnace

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Abstract

The research direction of this article is the main winch of the blast furnace, mainly focusing on the operation of its thruster. The main winch thruster of the blast furnace is a part of the brake that controls the braking and stopping of the winch. Whenever the material truck is in place, the thruster works, causing the brake pads to lock the brake wheels, thereby stopping the winch from rotating. Under high-strength pulling, the thruster continues to work and the temperature rises. If it is not cooled down, it will cause damage to the thruster, leading to brake failure and unpredictable serious consequences. In this article, we use a dedicated air duct and directional cooling to cool the thruster. The main structure of this plan is as follows: several air supply branch pipes are uniformly arranged along one side of the air supply main pipe, and the air supply branch pipe is surrounded by a U-shaped structure to push the thruster. The inner wall of the air supply branch pipe is equipped with a blowing port to spray towards the thruster, and the U-shaped ends of the air supply branch pipe are connected to the air supply main pipe. The air supply main pipe is set on the bracket of the air supply main pipe, and an inlet part is extended on the air supply main pipe to ensure efficient transmission of the air source. The above scheme ensures the normal operation of the thruster and ensures the stable operation of the blast furnace.

Keywords

Blast Furnace; Main Winch; Pusher; Lower the Temperature.

1. Introduction

The main winch thruster of the blast furnace is a part of the brake that controls the braking and stopping of the winch. Whenever the material truck is in place, the thruster works, causing the brake pads to lock the brake wheels, thereby stopping the winch from rotating. Under high-strength pulling, the thruster continues to work and the temperature inevitably rises. If it is not cooled down, the thruster will be damaged, leading to brake failure and unpredictable serious consequences. Usually, we use exhaust fans to cool the thrusters, and each thruster requires one exhaust fan. This method consumes a lot of cooling energy, and due to the location, the exhaust fan is far from the thruster, which greatly reduces the cooling effect; On the other hand, the exhaust fan has a high intensity of long-term working load, which is easily damaged and difficult to detect after damage. [1].

2. Technical Scheme for Cooling the Main Winch Thruster of Blast Furnace

We have proposed a cooling device for the main winch thruster of a blast furnace, which mainly includes an air source pipe, an air source pipe bracket, an air bag, and a compressed air pipeline network. The air source main pipe is divided into four air source branch pipes, each of which is in a U-shaped structure, with both ends connected to the air source main pipe. The three sides of the U-shaped air source branch pipe are welded with flat and long spray ports, and the two ends of the air source main pipe are welded with T-shaped brackets. The air source main pipe is placed on the bracket

of the air source main pipe, and the placement is stable through the T-shaped structure at both ends. Below the middle of the air source main pipe, a detachable hose is connected, and the other end of the hose is connected to a hard pipe, An electric valve is installed on the hard pipe, which is connected to the air bag at the back. The other end of the air bag is connected to the compressed air pipe network. A maintenance ball valve and a drain valve are installed below the air bag for automatic drainage of the air bag. A temperature sensor is installed on each of the four thrusters, setting the upper and lower temperature limits. When the temperature exceeds the upper limit, the control circuit opens the electric butterfly valve, and compressed air is directly sprayed onto the thruster through the air source pipe. When the thruster temperature drops to the lower limit, the control circuit closes the electric butterfly valve. There is a lifting lug welded above the middle of the air source main pipe, and a hook is installed on the ceiling facing the lifting lug. The lifting lug and hook are connected through a chain hoist. When the pusher needs to be replaced, the hose is removed, and the air source main pipe is lifted to a suitable position through the chain hoist. The T-shaped structure at both ends of the bracket and air source main pipe ensures that the air source main pipe steadily rises. [2].

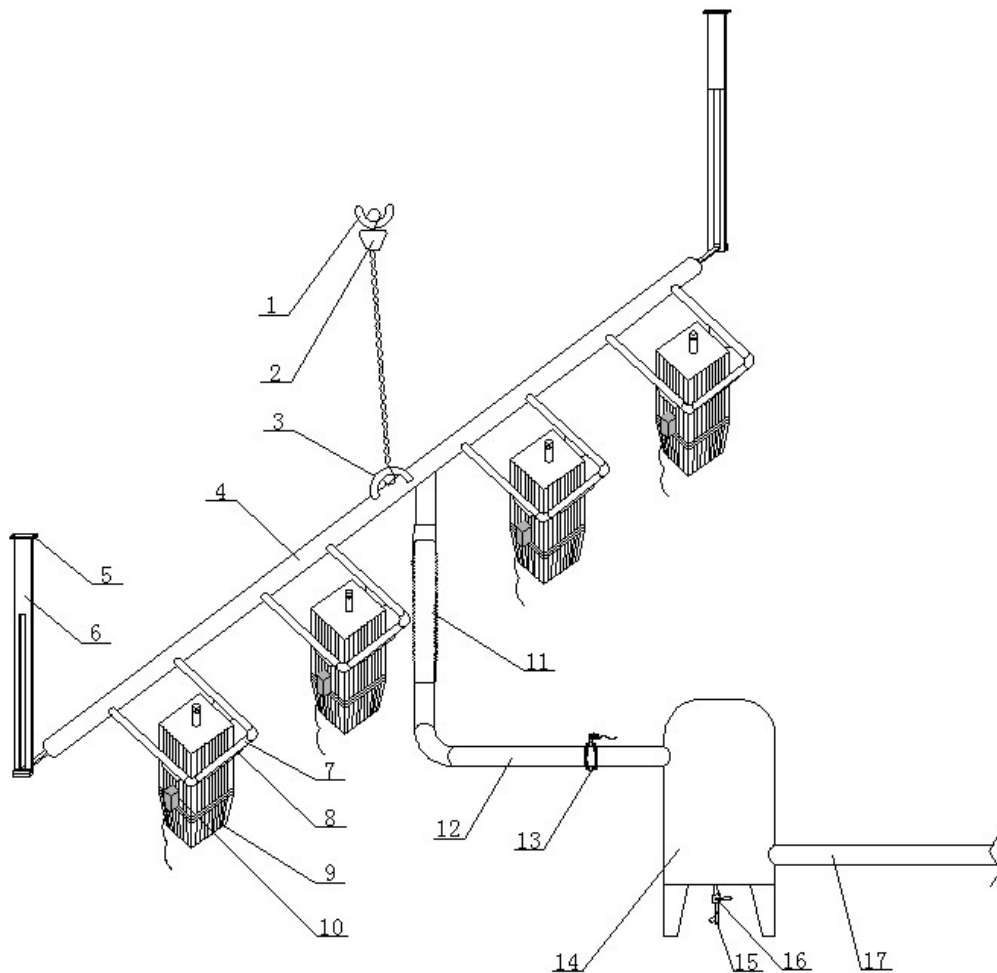


Figure 1. is a schematic diagram of the cooling device for the main winch thruster of the blast furnace

In the picture: 1. Hook 2. Chain hoist 3. Lifting lug 4. Air source main pipe 5. Steel plate 6. Air source main pipe bracket 7. Air source branch pipe 8. Blowing port 9. Pusher 10. Temperature sensor 11. Hose 12. Hard pipe 13. Electric valve 14. Air bag 15. Drain valve 16. Maintenance ball valve 17. Compressed air pipeline network.

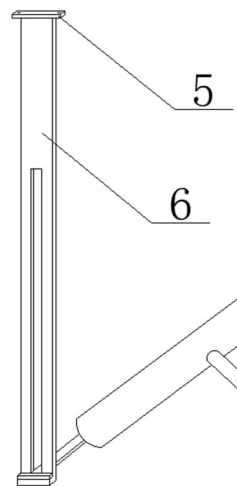


Figure 2. is an enlarged schematic diagram of the air supply main pipe bracket

The main air supply pipe has a T-shaped structure at both ends, which is clamped inside the bracket. The main air supply pipe is placed and moved smoothly; The air supply main pipe bracket is welded to the preset steel plate on the ceiling, ensuring the stability of the air supply main pipe bracket; The style of the nozzle on the three sides of the air supply branch pipe is flat and long, ensuring uniform cooling of the entire surface; The central lower part of the gas source main pipe is connected to the gas source, ensuring efficient transmission of the gas source; There is a chain hoist connected above the middle of the air source main pipe, which can raise the air source main pipe and ensure that there is no negative impact on the air source main pipe during thruster maintenance; The U-shaped ends of the air supply branch pipe are connected to the main air supply pipe, accelerating the speed of the air source reaching all surfaces of the thruster; A maintenance ball valve and a drain valve are installed below the air bag, ensuring automatic drainage when there is water inside the air bag; Each of the four thrusters is equipped with a temperature sensor. As long as one of the thrusters reaches the upper temperature limit, the electric butterfly valve will open and start spraying for cooling. Only when the temperature of all four thrusters is below the lower limit, the electric butterfly valve will close; The main air source pipe and the air bag are connected through detachable hoses, ensuring that the main air source pipe and the air bag can be separated; Air source main pipe diameter $\phi 59$, diameter of air supply branch pipe $\phi 32$. The pull rope is a chain hoist, which is a simple and convenient manual lifting machine suitable for short distance lifting of small equipment and goods. It is sturdy, wear-resistant, and has high safety performance. [3].

3. Conclusion

In summary, the plan we have envisioned for cooling the main winch thruster of the blast furnace is practical and feasible. The device described in the plan has a simple structure and is easy to use, which can effectively reduce the temperature of the thruster and save resources. At the same time, it reduces the equipment failure rate and ensures the stability of production.

References

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