

Development of Repair Device for Core Package of Aluminum Electrolytic Capacitor

Jun Ma^{1, a}

¹Suzhou Vocational Institute of Industrial Technology, Suzhou, 215104, China.

^amaj@siit.edu.cn

Abstract

The repair device of aluminum electrolytic capacitor core package is not mentioned in the existing literature. In order to solve this problem and achieve the purpose of repairing the damaged oxide film of aluminum electrolytic capacitor core package, the author invented the aluminum electrolytic capacitor core package repair device. This paper describes the technical scheme, solution and implementation scheme of the new device development, analyzes the structure and working mode of the whole repair device, and puts forward the solution.

Keywords

Device; repair tank body; repair fluid supply system; DC regulated power supply.

1. Introduction

Aluminum electrolytic capacitor has been developed for many years. Its traditional manufacturing process includes aluminum foil cutting, core package coiling, electrolyte immersion, shell packaging, aging and so on. But this kind of liquid electrolyte aluminum electrolytic capacitor electrical performance is not very good, life is also relatively short. With the continuous development of technology, solid electrolyte aluminum electrolytic capacitors have been developed in recent years. However, due to the poor repair effect of solid electrolyte for the damaged oxide layer of formed aluminum foil, it is necessary to repair the oxide film of the damaged formed aluminum foil before impregnation in order to improve the electrical performance of aluminum electrolytic capacitor. By repairing the oxide film before impregnation, the electrical performance of solid electrolyte aluminum electrolytic capacitor is greatly improved. In the existing literature records, the repair device of aluminum electrolytic capacitor core package is not mentioned, but the formation method and device of forming aluminum foil are recorded. The forming device of aluminum foil consists of tank body, upper and lower transmission roller, electrode plate, etc. However, this device can not be applied to repair the core package of aluminum electrolytic capacitor. In order to solve this problem and achieve the purpose of repairing the damaged oxide film on the core package of aluminum electrolytic capacitor, the author invented the repair device of the utility model.

2. Technical Proposal

The technical problem to be solved is to provide a repair device for aluminum electrolytic capacitor core package, which can repair the damaged oxidation film formed in the process of cutting and winding. The repair device has the advantages of simple structure, convenient manufacture and low cost. By the repair device, the damaged formed aluminum foil oxidation film of the aluminum electrolytic capacitor core package can be repaired. It also can improve the electrical characteristics of the aluminum electrolytic capacitor, and eliminate the corrosion of the repair on the anode and cathode leads of the aluminum electrolytic capacitor.

3. Solutions

The repair equipment adopts aluminum alloy profile bracket, on which is placed a repair tank body which can hold the repair liquid and a DC voltage stabilized power supply. At least one liquid inlet is arranged at the bottom of the repair tank body, and the repair solution supply system is connected with the bottom of the repair tank body, and liquid is supplied to the repair tank body through the liquid inlet. The negative pole of the DC regulated power supply is connected to the inner part of the repair tank and contacts with the repair fluid. The positive electrode contacts the product through the conductive medium, which is equivalent to that the positive electrode is connected to the pin of the aluminum electrolytic capacitor. Finally, it is electrified to form an electrochemical repair circuit. At least one overflow port is arranged on one side of the repair tank body, through which the repair liquid can maintain a certain liquid level depth and improve the repair effect.

The repair fluid supply system includes a flow control device, which is installed on the infusion pipe connected with the bottom of the repair tank to control the flow rate of the repair fluid. The flow control device can be either a flowmeter or a valve. By adjusting the flow rate, the flowability of the repair fluid can be increased and the repair effect can be improved.

A detachable flow regulating plate is horizontally installed near the bottom of the repair tank body. Several through holes are evenly arranged on the flow regulating plate, and the repair fluid entering the tank body through the liquid inlet at the bottom of the repair tank body flows upward through the through-hole of the flow regulating plate, so as to make the repair fluid flow more evenly and stably in the repair tank body and maintain a stable liquid level. When the stable liquid level is immersed in the compound solution of aluminum electrolytic capacitor core package, it will not corrode the anode and cathode leads of aluminum electrolytic capacitor because of the fluctuation of liquid level. Trusses that can move up and down can also be installed on the two outer sides of the repair tank body.

By moving the truss up and down, the depth of the product immersion into the repair is adjusted. At the same time, the truss or electrode plate is made of conductive material, which acts as a conductive medium. The voltage is applied to the product through the truss or electrode plate contact with the conductive strip welded with the product.

4. Implementation Plan

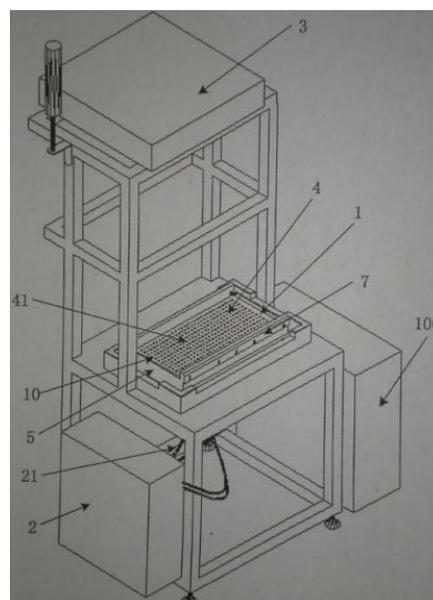


Fig 1. Structure schematic drawing of aluminum electrolytic capacitors' core repair device

As shown in Fig. 1, Fig. 2 and Fig. 3, the main structure includes repair tank body 1, repair fluid supply system 2 and DC regulated power supply 3.

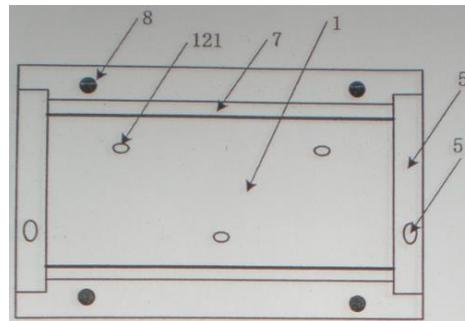


Fig 2. Top view of the bath body

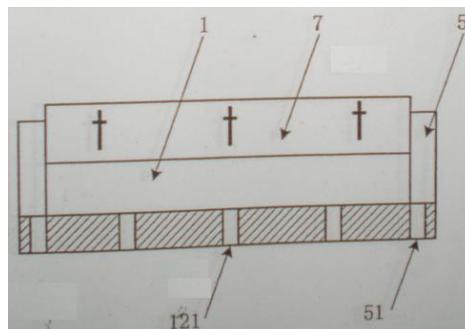


Fig 3. Diagrammatic cross-section of bath body

The repair tank body 1 is a tank body which can contain the repair solution. It can be square, round or other shapes. Its shape can be selected according to the production requirements. We choose the square tank body. The repair tank body is made of insulating materials and can be placed on the working table or support frame. The working table is made of insulating materials. At least one liquid inlet hole 121 is set at the bottom of the repair tank body, which is preferably evenly distributed. Three liquid inlet holes are set on the equipment to make the repair liquid enter the repair tank body more evenly. At least one overflow port 10 is arranged on the side of the repairing tank body to maintain a certain liquid level depth. In this equipment, the height of the repair tank is lower than the other opposite sides, thus forming two overflow ports 10. The repair fluid can overflow from the overflow port 10 on both sides of the relatively low side, maintain a certain level height, and keep the repair fluid in the flowing state and improve the repair effect. The flow regulating plate 4 is similar to the peripheral shape of the repair tank body, and a plurality of through holes 41 are evenly arranged on it. The flow regulating plate is horizontally detachable and installed inside the repair tank body, which is located above the upper and lower surface of the repair tank body, so that the repair fluid entering the tank body from the liquid inlet hole 121 flows upward through the through hole 41, so as to make the repair fluid flow more evenly and ensure the liquid level is stable. In order to save materials and reduce occupied volume, the overflow groove is only connected with the side with overflow opening, instead of surrounding the whole outside of the repair tank body. The overflow tank has at least one drain port 51. The repair fluid overflowing from the repair tank body flows into the overflow tank 5 and is collected together through the drain port 51. In order to save the amount of repair fluid, the repair fluid collected through the drain port can be returned to the repair solution supply system 2, which can be recycled for a certain period and replaced regularly.

The repair solution supply system 2 includes a liquid storage tank, a pump, an infusion pipeline and a flow control device, wherein the infusion pipeline 21 is connected with the bottom of the repair tank body 1, and the repair fluid can continuously enter the repair tank body through the liquid inlet hole 121 at the bottom of the repair tank body through the pump (select the type of pump according to the different repair solution, and select the water pump when the corrosion of the repair solution is small), thus the repair tank body is filled with repair liquid. The flow control device is installed in 21 infusion pipelines connected with the bottom of the repair tank. The flow control device can be a flowmeter and a valve. The flow meter is used in the equipment. By adjusting the flow meter, the required flow rate can be obtained to control the flow rate of the repair fluid. According to the needs of the products to be repaired, the appropriate flow rate is selected to achieve the best repair effect.

A truss 7 which can move up and down is horizontally installed on the two outer sides of the repair tank body, and at least two waist round holes are arranged on the truss to fix the truss on the two outer sides of the repair tank body respectively. In order to control the operation time more conveniently or realize the automatic up-down lifting repair, at least two jacking rods 8 are vertically installed on the two outer sides of the repair tank body, which can be connected with the cylinder for up and down movement. When the shelf with the repaired product is placed on the repair tank body, the top rod supporting the shelf moves downward under the action of the cylinder, and the shelf goes down with the product to be repaired, so that the product to be repaired is immersed in the repair solution. By adjusting the height of the two trusses 7 supporting the product to be repaired, the height of the product to be repaired can be adjusted so that the product to be repaired reaches the depth that needs to be dipped into the repair solution, and good repair effect can be achieved, and it will not corrode the lead-out electrode of the anode and cathode of the aluminum electrolytic capacitor. At the end of the operation, the ejector rod moves upward to support the shelf, so that the repaired product can be separated from the repair fluid and the repair operation is finished. Therefore, it is convenient to automatically control the operation time, realize the automatic up and down lifting, save manpower and reduce cost, and can also be applied to the repair of products with different sizes and specifications. The DC regulated power supply 3 can set the required repair voltage according to the operation needs. Its negative pole is fixed in the repair tank body through the insulation lead-in extension line, and contacts with the repair liquid in the repair tank body. The positive electrode is connected with one of the trusses through the insulation lead-in extension line to form an electrochemical repair circuit.

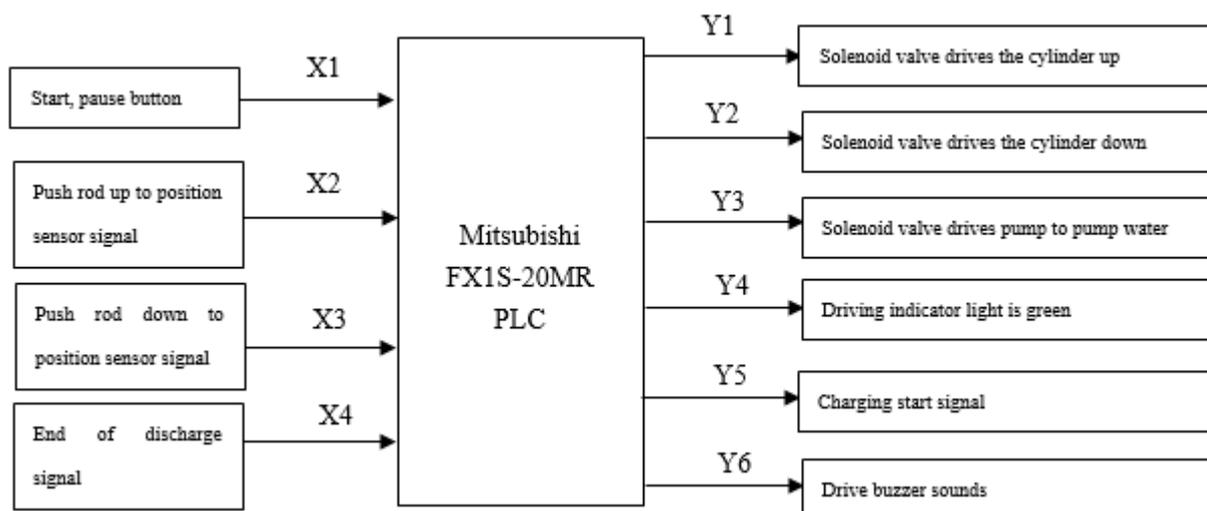


Fig 4. PLC-control block diagram of the device

In order to further improve the operation control accuracy and repair effect, the control box 100 can be set. There are Mitsubishi PLC, start pause button, solenoid valve and digital time relay to realize automatic control of repair operation time, top bar movement, product counting, etc. The specific PLC control diagram is shown in Fig.4, X is input signal, y is output signal, and PLC control flow chart is shown in Fig.5.

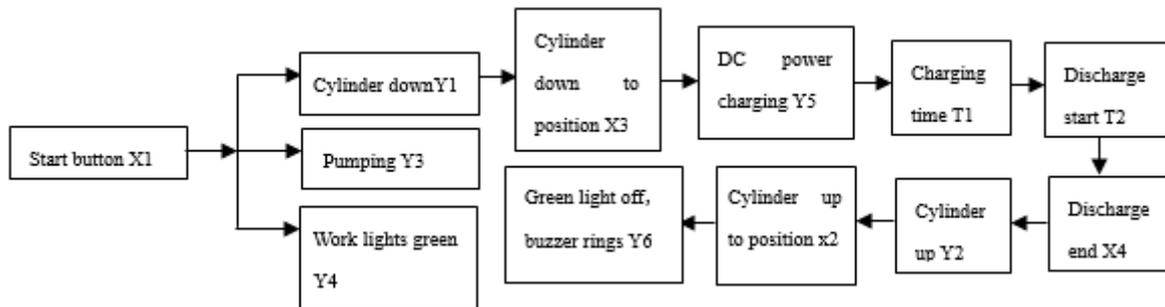


Fig 5. Program-control flow chart of the device

5. Conclusion

The device has the advantages of simple structure and convenient manufacture. It can adjust the flow rate of repair fluid to meet the repair requirements of different products and achieve better repair effect. Since the repair fluid is in flow state, the repair effect is improved. Due to the addition of a flow regulating plate, the repair fluid flows smoothly and maintains a stable liquid level, which improves the consistency of the immersion depth of the repaired products, ensures the repair effect, and ensures that the repair fluid does not contact the anode and cathode leads of the product to be repaired, and avoids its corrosion. In addition, the top bar and truss can be adjusted up and down, which can be used for up and down repair, which can meet the repair requirements of various products.

References

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