

[54] METHOD OF BLACKENING A STEEL
COMPONENT FOR A COLOR CATHODE
RAY TUBE

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[58] Field of Search..... 117/130 E; 148/6.3, 6.14,
148/6.15 R

[56] References Cited

UNITED STATES PATENTS

2,836,510 5/1958 Bolin 117/130 E

3,088,846 5/1963 Lee 117/71 M

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ABSTRACT

The steel components of a cathode ray tube, mainly the aperture mask and the aperture mask frame are blackened by immersing the same in an electroless plating bath selected from the group consisting of nickel and cobalt and after subsequent rinses immersing again in a strong oxidizing acid and firing the component in air at about 450°C to form a black, complex nickel or cobalt compound on the surface of the component.

4 Claims, No Drawings

METHOD OF BLACKENING A STEEL COMPONENT FOR A COLOR CATHODE RAY TUBE

BACKGROUND OF THE INVENTION

This invention relates generally to the aperture mask and aperture mask frames of color picture tubes and more particularly to a method of applying thereto a black surface coating. It has been common practice for many years to blacken the surface of the aperture mask and aperture mask frame of a color picture tube to provide better heat radiation characteristics. Generally, this has been accomplished by merely firing the frames or masks in a wet atmosphere. This process generally yields a black oxide of iron; however, many disadvantages are present in this process. For example, under many conditions a brown oxide of iron is formed either during the process itself or at some point in time during the storage of the component. Further, iron oxide has a tendency to decompose in a vacuum when it is heated and bombarded with electrons as is the case during operation of the color cathode ray tube in which it is employed.

Therefore, it would be advantageous if a process could be found which would blacken these steel components without having the disadvantages of the prior art techniques.

OBJECTS AND SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to obviate the disadvantages of the prior art.

It is another object of the invention to provide a simple and reliable method of blackening steel components of color cathode ray tubes.

It is yet another object of the invention to provide a stable blackened surface upon the steel components of a color cathode ray tube.

These objects are accomplished in one aspect of the invention by the provision of a method whereby the steel components of a color cathode ray tube, such as the aperture mask frame and the aperture mask itself, are provided with a nickel or cobalt compound coating from an electroless plating bath and subjecting this coating to a strong oxidizing acid and subsequently firing the same in air at about 450°C to provide a complex black nickel or cobalt compound upon the surface. The compound formed by this process is extremely stable and has shown the advantage of remaining black even after many passes at about 450°C in an air atmosphere.

It is believed that the black nickel or cobalt compound formed on the surface is a nickel or cobalt phosphide having the formula Ni_3P_2 or Co_2P .

DESCRIPTION OF THE PREFERRED EMBODIMENTS

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims.

Referring now to the invention with greater particularity, a steel component of a cathode ray tube such as an aperture mask frame or the aperture mask itself, is first degreased by any suitable method. After degreasing the component is immersed in a 50% hydrochloric acid bath for about 1 minute. The acid is then removed by rinsing the component in deionized water. The com-

ponent is next placed in an electroless nickel or cobalt plating bath for about 15 minutes. A number of such electroless nickel plating baths are commercially available and excellent results have been had with a bath known as Shipley NL-62, which is available from the Shipley Company, Newton, Mass. A number of other nickel plating baths both acid and alkaline are disclosed in U.S. Pat. No. 2,532,283. Additionally, cobalt plating baths are disclosed in U.S. Pat. No. 2,532,284.

A particularly workable nickel plating bath is composed of 30 grams per liter of nickel chloride, 50 grams per liter of sodium glycollate, and 10 grams per liter of sodium hypophosphite. The pH of the plating bath should be between 4 and 6 and the temperature of the bath should be about 190°F. If necessary the pH can be adjusted by the addition of sodium hydroxide.

A suitable cobalt plating bath is composed of 30 grams per liter of cobalt chloride, 35 grams per liter of sodium citrate, 50 grams per liter of ammonium chloride and 20 grams per liter of sodium hypophosphite. As this is an alkaline bath the pH should be about 9-10 and the temperature about 195°F to 205°F. If necessary, the pH can be adjusted by addition of ammonium hydroxide.

After immersion in the electroless nickel or cobalt plating bath which as has been mentioned above, should be for about 15 minutes, the component is removed from the bath and rinsed in deionized water. Next, the component is immersed in a strong oxidizing acid for 30 to 45 seconds. A suitable oxidizing acid contains 3 parts phosphoric, 1 part sulfuric, and 1 part nitric, all in concentrated form. After the oxidizing acid bath the component is removed and quickly rinsed in warm tap water. Further rinses are then performed in deionized water, and anhydrol. The component is then dried and fired for about 1 hour in air at about 450°C.

As stated above, the black surface coating that is now formed on the component is a complex nickel or cobalt compound which is believed to be Ni_3P_2 or Co_2P , that is, a nickel or cobalt phosphide. These compounds have been found to be extremely stable during the various processing procedures used to fabricate a cathode ray tube, and these procedures involve numerous bakings in air at above 400°C. Furthermore, either coating is very stable during operation of the cathode ray tube in which the component is incorporated even though it is being bombarded with electrons in a vacuum and is subject to repeated heating and cooling.

It will be seen from the above that use of this process obviates many of the disadvantages of the prior art and when applied to the aperture mask frame or the aperture mask itself of a color cathode ray tube has many unique properties.

While there has been shown what is at present considered to be the preferred embodiments of the invention, it will be apparent to those skilled in the art that various changes and modifications can be made herein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. A method of blackening a steel component which comprises the steps of: degreasing said component; immersing said component in a 50% hydrochloric acid bath for about 1 minute; rinsing said component in deionized water; immersing said component in an electroless plating bath selected from the group consisting of nickel or cobalt for about 15 minutes, said plating bath

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including an effective amount of a reducing agent including a hypophosphite compound; rinsing said component in deionized water; immersing said component in a strong oxidizing acid bath for 30 to 45 seconds; rinsing said component in warm tap water; rerinsing said component in deionized water; rerinsing said component in anhydrol; drying said component; and firing said component in air for about 1 hour at about 450°C.

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2. The method of claim 1 wherein said component is a steel frame of an aperture mask.

3. The method of claim 1 wherein said component is a steel aperture mask.

4. The method of claim 1 wherein said oxidizing acid is comprised of 3 parts phosphoric, 1 part sulfuric, and 1 part nitric acid.

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