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Shoemaker et al.

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[54] ALUMINUM SHIELD FOR A ROLL IN CONTINUOUS STRIP APPARATUS

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Related U.S. Application Data

[62] Division of Ser. No. 796,722, Feb. 5, 1969, Pat. No. 3,617,455.

[52] **U.S. Cl.** **204/211,** 204/231, 204/245, 204/DIG. 7

[51] **Int. Cl.**.....**B01r 3/00,** C23b 5/68

[58] **Field of Search**.....204/211, 206, 231, DIG. 7, 204/145 F, R, 243, 245, 228, 207–210

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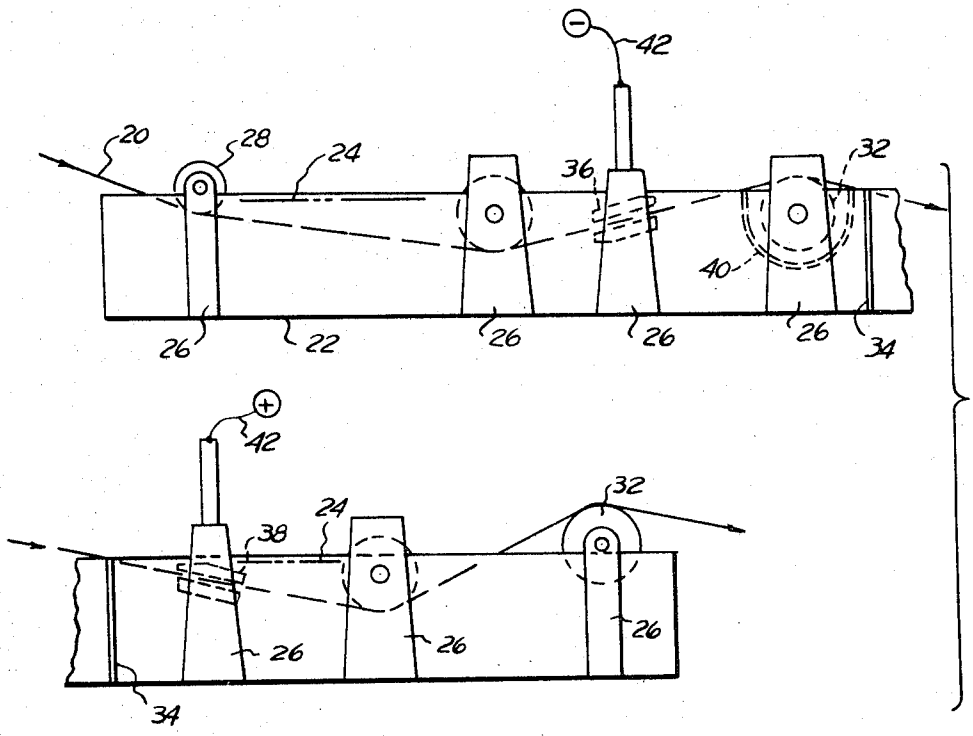
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[57] **ABSTRACT**

Molten salt bath electrolytic descaling apparatus employing an electrical shield of aluminum around an immersed cast iron roll and electrically charged oppositely from the electrical charge on the strip to prevent current flow from the strip to the electrolyte through the roll.

1 Claim, 2 Drawing Figures



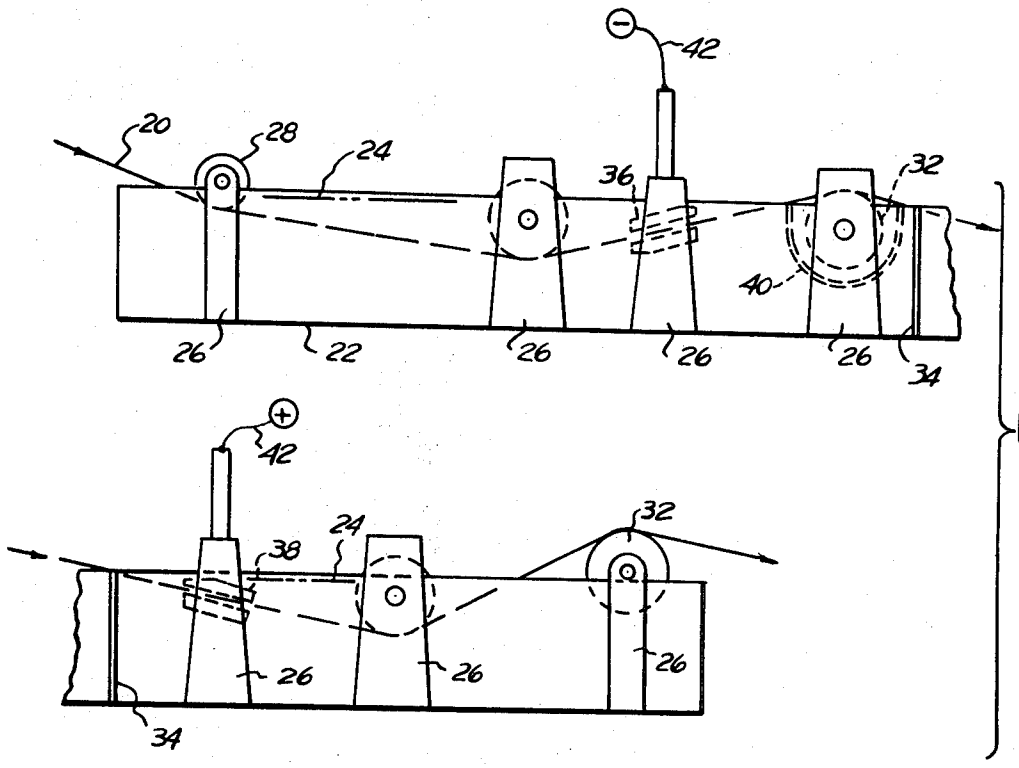


FIG. 1

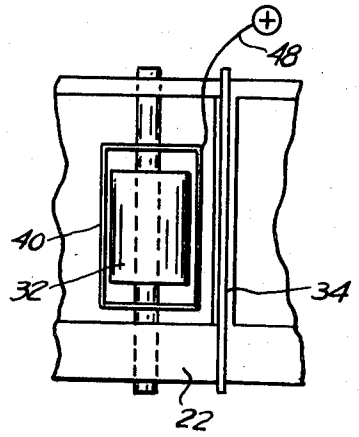


FIG. 2

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ALUMINUM SHIELD FOR A ROLL IN CONTINUOUS STRIP APPARATUS

This application is a division of our co-pending patent application, Ser. No. 796,722 filed Feb. 5, 1969, now U.S. Pat. No. 3,617,455 of Nov. 2, 1971 entitled "Apparatus and Process for Molten Salt Bath Electrolytic Descaling of Ferrous Metal Strip."

GENERAL DESCRIPTION

It is known to descale ferrous metal strip continuously (U.S. Pat. No. 2,468,006 of Apr. 19, 1949) by apparatus including a ferrous metal tank containing molten salt electrolyte and mounted at its ends in the tank; with means for directing the strip to be descaled first into said electrolyte and then over an unimmersed or exposed part of said roll and thus out of said electrolyte and said tank; with means in the electrolyte near the roll for electrically charging the strip as it approaches the roll.

Such process as described in said U.S. Pat. No. 2,468,006 has long been known to the art and is often referred to as Kolene No. 4 Process, identified by its originator Kolene Corporation of Detroit, Michigan.

In the past, such process has often resulted in arcing and burning of the strip being descaled during the period of current flow from the charging grid which electrically charges the strip as it approaches the roll and it has been discovered by the invention hereof that such harmful results are often due to the suspected flow of current from the charging grid to the cast iron roll commonly employed through the strip itself and with the circuit completed and thus current enabled to flow by the contact between the immersed part of the roll and the electrolyte as well as by the electrical conductivity established by the conventional mounting of the ends of the roll in the sides of the tank in a conductive manner.

OBJECTS OF THE INVENTION

An object of the invention hereof therefore is to prevent such harmful results and this has been accomplished by employing an electrical shield around the cast iron roll. In the preferred embodiment here shown, such shield is of aluminum and is filled with molten salt and surrounds the immersed part of the roll and has an open top exposing the upper part of the roll over which the strip is directed. Such shield is charged oppositely from the charge placed on the strip and consequently there is built up and maintained on the surface of the shield an inert film which prevents current flow from the strip charging grid through the cast iron roll, the circuit being disestablished by the isolation of such roll from the electrolyte in the tank and from the insulating mounting of the roll in the tank as here disclosed.

THE DISCLOSED EMBODIMENT

The embodiment just described is disclosed in the appended drawing as a preferred embodiment.

In this drawing:

FIG. 1 is a diagrammatic view of a conventional apparatus equipped with the aluminum shield and other parts of the invention.

FIG. 2 is a fragmentary elevation view of the aluminum shield and associated cast iron roll only of the entire apparatus.

DETAILED DESCRIPTION

The drawing shows apparatus for descaling a strip **20** which includes a ferrous metal tank **22** containing electrolyte of molten salt of the formulation of said U.S. Pat. No. 2,468,006, the electrolyte filling the tank up to the level **24**. Suitably mounted on standards **26** are directing rolls **28** including particularly a large cast iron directing roll **32** which direct the strip **20** to be descaled first into the electrolyte and then over the unimmersed part of the roll **32** and thus out of the electrolyte and the tank **22**.

The apparatus here disclosed in effect comprises two separate baths contained within the same tank **22**, the bath in the leading or left hand side of the tank being isolated by an electrical barrier **34** from the bath at the trailing or right side of the tank **22**.

In each bath is a means **36–38** for electrically charging the strip as it approaches directing rolls, with such means being within the electrolyte and near the adjacent roll. The left hand bath is negative and the means **36** comprises a negative power supply grid of conventional form negatively charged from any external negative charging apparatus as illustrated diagrammatically. The right hand bath is a positive bath and thus the grid **38** is positively charged as illustrated.

THE IMPROVEMENT

What has been described thus far is conventional. What is now to be described is the improvement of the invention.

First the rolls **32** are insulatedly mounted in the tank **22** to prevent current flow from the rolls to the tank.

Secondly, an aluminum shield **40** is built around the rolls **32** isolating the roll from the electrolyte.

The shield **40** used is in the form of an open top tub of aluminum and is located under and around the immersed surface of the roll **32** and is adjacent to said roll but is spaced from it and is filled with the molten salt.

Third, means are provided and are shown diagrammatically as an electrical lead **48** for electrically charging the shield **40** in a manner to prevent current flow from the strip charging means **36** to the electrolyte through the strip **20** and the roll **32**.

Fourth, the strip charging means **36** charges the strip oppositely from the manner in which the shield charging means **48** charges the shield. Thus in the left hand tank wherein the strip charging means **36** charges the strip cathodically or negatively, the shield charging means **48** charges the shield anodically or positively.

PROCESS

The invention that has been described in terms of apparatus in the foregoing may equally be described in terms of process as follows.

Starting with the conventional process wherein a ferrous metal strip is being descaled electrolytically by a molten salt bath in a ferrous metal tank, and wherein the strip is directed over a ferrous metal roll partly immersed in the electrolyte and mounted at its ends in the tank and wherein the strip is electrically charged as it approaches the roll, the improvement in the process is as follows.

First, the roll over which the strip is directed, namely roll **32** is maintained electrically insulated from the tank **22**.

Secondly, the immersed part of the roll **32** is shielded and isolated from the electrolyte by the use of an aluminum shield **40** around the roll **32**.

Third, the shield **40** is charged electrically in a manner to prevent current flow from the strip charging means **36** to the electrolyte through the strip **20** and the roll **32**.

Fourth, the charge on the strip from means **36** is opposite from the charge on the shield from means **48**.

OTHER OBSERVATIONS

It is of course understood that the shield is continuously charged during the electrolytic operation for the purposes desired. However, once the film is built up on the shield it is established and from then on it merely maintained during the electrolytic operation.

It is important to note that current flow from the strip to the roll **32** is disestablished by the fact that the roll **32** is electrically insulated from the tank **22** as well as being electrically isolated from the electrolyte by the shield.

While in the illustation here given but one shield **40** is shown, and this shield is anodically charged and is located around the roll **32** of the cathodic bath, the expedient here illustrated as new may be employed in other parts of the bath and process, as for example, around roll **32** of the positive bath. Of course, it will be required that the means for charging the shield operates to charge the shield oppositely from the means in the same bath which charges the bath itself by charging the strip.

It is believed that the charging of the salt filled aluminum shield builds up a non-conducting film of aluminum oxide on the shield; such film forms an insulating barrier between the roll **32** and the electrolyte.

Concluding the foregoing description of a preferred embodiment, we now turn to the claims which follow.

We claim:

1. A molten salt bath electrolytic descaling apparatus comprising, in combination:

a ferrous metal tank adapted to contain electrolyte of molten salt;

a ferrous metal exit roll positioned to be partly immersed in said electrolyte and insulatedly mounted on its ends in said tank;

means adapted for directing a ferrous metal strip to be descaled first into said electrolyte and then over an unimmersed part of said exit roll and thus out of said electrolyte and said tank;

electrode means in said electrolyte near said roll for charging said strip as it approaches said roll;

an aluminum shield in the form of an open top tub under and around the lower surface of the roll adjacent but spaced from it, and adapted to be filled at least partly with electrolyte;

and means for positively charging said shield in a manner to cause the formation of an inert film on the shield whereby to prevent current flow from said electrode means to the electrolyte through the strip and the roll;

with said shield charging means being arranged to charge the shield oppositely from the charge on said electrode means.

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