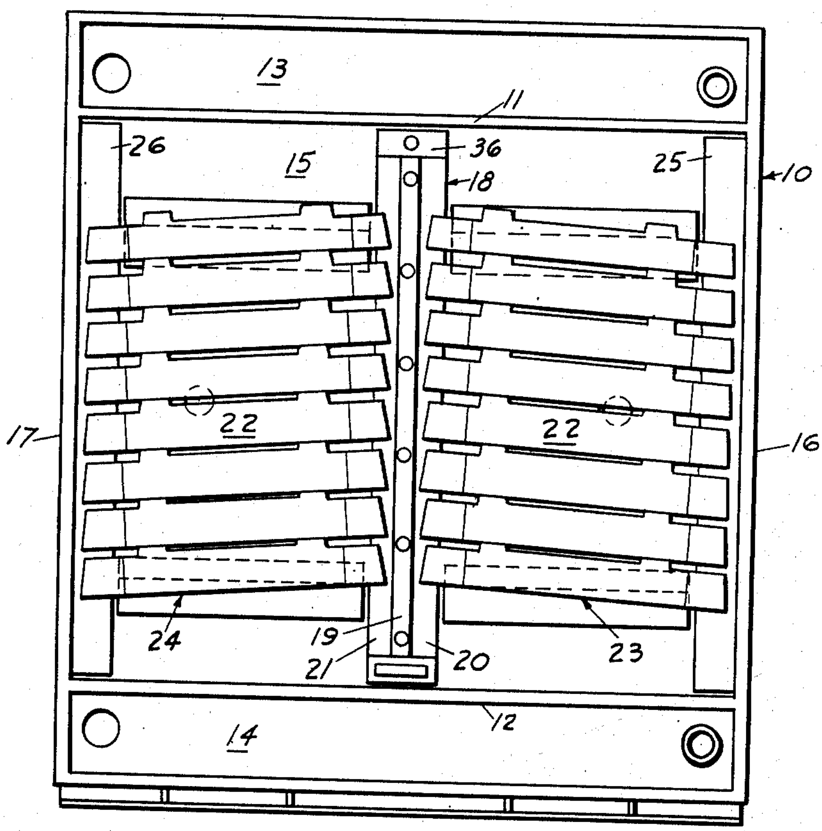
Sept. 9, 1952 | A. B. WILSON | 2,610,145

ELECTROPLATING

Original Filed May 28, 1943 | 2 SHEETS—SHEET 1

Fig. 1



Inventors
ABRAM B. WILSON

Attorney

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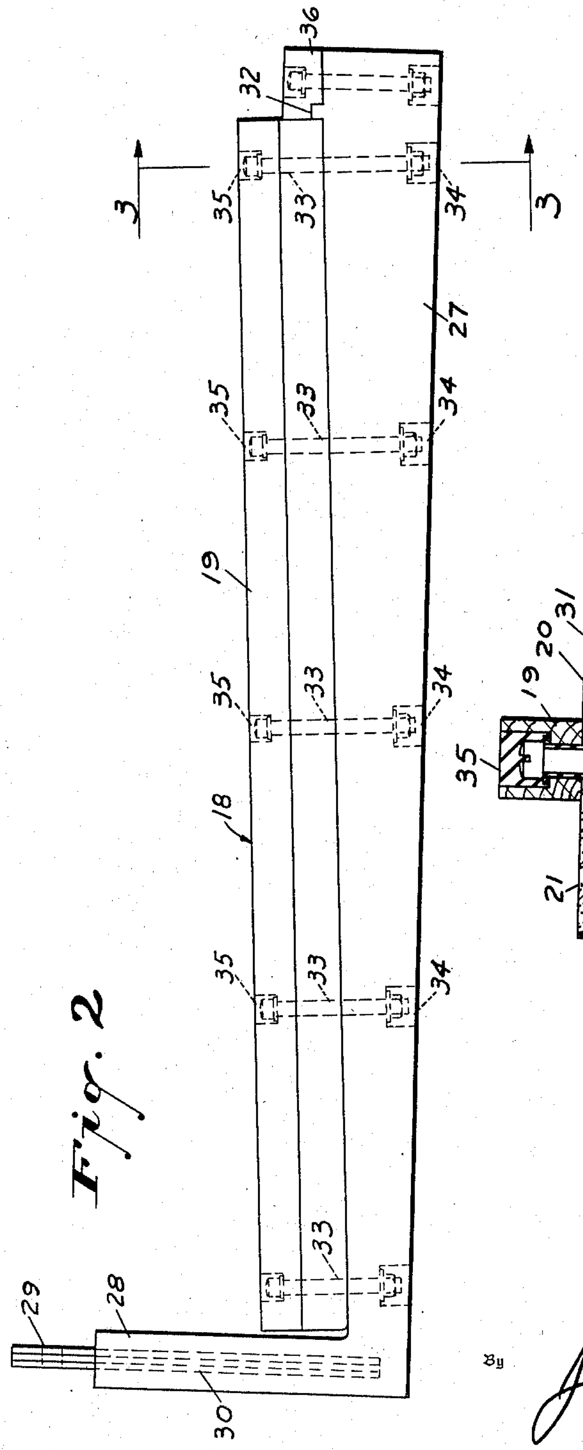

Fig. 2

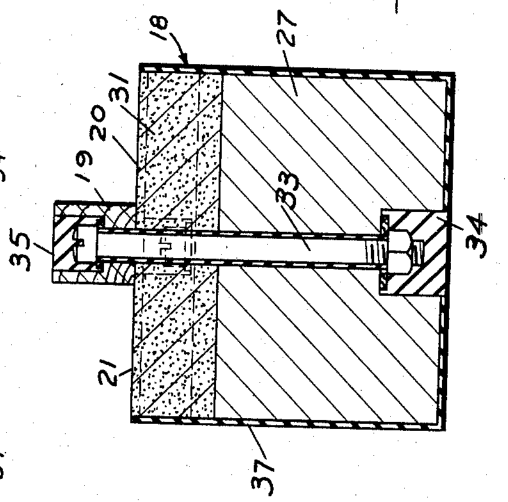

Fig. 3

Inventor
ABRAM B. WILSON

By

Attorney

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ELECTROPLATING

Abram B. Wilson, Weirton, W. Va., assignor to National Steel Corporation, a corporation of Delaware

Original application May 28, 1943, Serial No. 488,866. Divided and this application March 2, 1949, Serial No. 79,150

2 Claims. (Cl. 204—206)

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The present invention relates to continuous electroplating of a moving strip having a conductive face.

More particularly, the present invention relates to electroplating of a protective metal such as tin, zinc, nickel, chromium, etc. on a metal strip, wherein anodes of the coating metal are supplied with electroplating current through a connection submerged in the electrolyte.

This application is a division of application Serial No. 488,866, now abandoned, filed May 28, 1943, by Walter W. Kompart and myself as joint inventors.

The present invention is especially adapted for use in electroplating systems of the general type disclosed in copending application Serial No. 487,758, filed May 20, 1943, by Ernest W. Rieger and Clarence J. Klein which issued as Patent No. 2,399,254 on April 30, 1946. In electroplating systems of this type a moving strip having a conductive face, for example, steel strip, is moved through an electroplating zone in which at least one face of the strip is contacted with an electrolyte. Submerged under the surface of the electrolyte and in electrolytic relation with the face of the strip are anodes of the metal to be plated on the strip. These anodes may be arranged in any desirable manner to give a uniform coating action, but normally they are movably supported on anode supports from at least one of which they collect electroplating current. Since the connection between these anodes and the support which carries the electroplating potential must be in the electrolyte, many difficulties have been experienced in maintaining suitable electrical contact.

An important object of the present invention is the provision of an efficient electrical connection between submerged soluble anodes and a source of electroplating current.

A further important object of the present invention is the provision of an efficient electrical connection between movable soluble anodes submerged in electrolyte and a source of electroplating current.

A further important object of the present invention is the provision of apparatus for electroplating moving strip including an improved anode support for supplying electroplating current to movable soluble anodes which are submerged in electrolyte.

Other objects of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which disclose apparatus incorporating the present invention.

Figure 1 is a plan view of an electroplating cell incorporating the present invention, the strip to be plated being omitted;

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Figure 2 is an enlarged view in side elevation of the embodiment of the present invention shown in Figure 1; and

Figure 3 is an enlarged view in cross section taken on the line 3—3 of Figure 2.

Referring to the drawings, an electroplating cell is shown which may be of the type more specifically disclosed in Patent No. 2,399,254 referred to above. Briefly, this cell embodies a tray indicated generally at 10 having a pair of partitions 11 and 12 defining a pair of overflow troughs 13 and 14 and an electroplating cell 15 which is normally filled with an electrolyte (not shown) with which the strip to be plated makes contact. End walls 16 and 17 of the tray are of the same height as partitions 11 and 12 so that electrolyte pumped into cell 15 will overflow all the walls when the tray is level. It will be apparent that the strip can move through this cell with troughs 13 and 14 disposed on either side of the moving strip, or a pair of strips moving side by side could pass through the cell parallel to end members 16 and 17.

Considering the strip as moving through the cell with troughs 13 and 14 disposed on either side of the moving strip it will be apparent that cell 15 is divided by an anode guide or support indicated generally at 18 extending transversely to the path of the strip. Member 18 includes a guide 19 which may be of wood or the like forming a pair of shoulders 20 and 21 which slidably receive the ends of anode elements 22. A series of anode elements 22 make up the pair of anodes indicated generally at 23 and 24. Extending parallel to member 18 are a pair of guide members 25 and 26 which support the other ends of the anode elements 22. Shoulders 20 and 21 of member 18 and the upper surfaces of guide members or anode supports 25 and 26 are inclined upwardly from the trough 14 side of the cell so that fresh anode elements can be periodically inserted at the lower end and eroded anode elements withdrawn at the upper end of the incline to make possible continuous replacement of the anode.

The details of construction of member 18 are best shown in Figures 2 and 3. A base member 27 which may be formed of a metal having high electrical conductivity presents an extension 28 designed to project above the surface of the electrolyte for connection with a source of electroplating current. Extension 28 incorporates bus bar connection 29 which will generally be formed of copper bars. Where base member 27 is not formed of copper, these bars may be extended as at 30 so as to be embedded in the metal of the extension 28. Supported on base or current carrying member 27 is an anode contact strip 31. A projection 32 on base 27 forms an abutment for one end of strip 31. Guide member 19 is positioned along strip 31 to present the shoulders or shoulder portions 20 and 21. To hold the parts together, a plurality of bolts 33 are used and the parts drilled to give bore holes slightly larger than the bolts. Current carrying member 27 is countersunk at 34 and guide 19 is countersunk at 35 to receive the nut and boltheads respectively. In order to protect the bolts and nuts from attack by the chemicals in the electrolyte, an insulating-acid-resisting plastic material is inserted in the bore hole around bolt 33 and in the countersinks 34 and 35. Where deemed necessary, an eroded anode rest 36 may be bolted or fastened in any desirable manner to the outer end of base member 27 to receive the end of an eroded anode element ejected from the anode.

Anode contact member 31 is molded or formed in any suitable manner to give a hard carbon surface for engagement with the anode, which surface shall be a good conductor of electricity and have good wear resistant characteristics. Since the surface is continuous, the anodes may be moved therealong with electrical contact being maintained.

In order to prevent the electrolyte from attacking base member 27, a protective coating such as a rubber base paint 37 is applied to the base member. The base member is formed of metal having high electrical conductivity to better distribute the heavy electric current along the length of member 31. Such metal is corrodible; that is, it is attacked and dissolved. This protective coating may cover all the parts of the support below the liquid level of the electrolyte except for the upper surfaces of shoulders 20 and 21. Although not essential, it is an advantage to cover the sides of anode contact member 31 with this protective coating to reduce to a minimum evolution of gas at the carbon surface so that exposed surfaces of carbon member 31 and the base member are covered with a protective except for the upper anode supporting surface or surfaces of member 31. Due to the conditions present, anode contact member 31 will act as an insoluble anode and there will be some evolution of gas wherever the electrolyte contacts the carbon surface. Only the upper surfaces of shoulders 20 and 21, essential as contact surfaces, need to be left exposed.

I claim:

1. Apparatus for continuously electroplating a moving strip of material having a conductive surface in which a tray presents an electroplating cell adapted to have the strip move across the cell from end to end in a horizontal path with the conductive surface thereof in contact with the electrolyte in the cell comprising an anode-supporting structure in the tray below the path of the strip, the anode-supporting structure including a supporting base member of electrically conductive, corrodible metal extending across the tray and the path of the strip and having an upper surface extending across from side to side of the path of the strip, means for connecting the base member to a source of electroplating current, a member supported by the base member and formed of carbon resistant to attack by the electrolyte and disposed below the path of the strip in the electrolyte of the cell in electrical engagement with the upper surface of the supporting base member along the length of the carbon member, the carbon member presenting an upper surface facing toward and extending across from side to side of the path of the strip and the conductive surface of the strip, and a protective coating on the surfaces of the base member and the carbon member exposed to the electrolyte to prevent the electrolyte from chemically acting on the same, except the upper surface of the carbon member which is left exposed, and a plurality of soluble, electroplating anode elements submerged in the electrolyte and supported by the anode-supporting structure in electrolytic relationship with the conductive face of the strip, the anode elements being slidably mounted on and in direct electrical contact with the exposed upper surface of the carbon member.

2. Apparatus for continuously electroplating a moving strip of material having a conductive surface in which a tray presents an electroplating cell adapted to have the strip move across the cell from end to end in a horizontal path with the conductive surface thereof in contact with the electrolyte in the cell comprising an anode-supporting structure in the tray below the path of the strip, the anode-supporting structure including a supporting base member of electrically conductive corrodible metal extending across the tray and the path of the strip and having an upper surface extending across and from side to side of the path of the strip, means for connecting the base member to a source of electroplating current, an elongated guide member, a shoulder-forming portion formed of carbon resistant to attack by the electrolyte extending along each side of the guide member and being disposed below the path of the strip in the electrolyte of the cell in electrical engagement with the upper surface of the base member along the length of the carbon portion, the carbon portions being supported by the base member and each presenting an upper surface facing toward and extending across from side to side of the path of the strip and the conductive surface of the strip, and a protective coating on the surfaces of the base member and the carbon portions exposed to the electrolyte to prevent the electrolyte from chemically acting on the same, except the upper surfaces of the carbon portions which upper surfaces are left exposed, and two sets of soluble, electroplating anode elements submerged in the electrolyte and supported by the anode-supporting structure below the strip in electrolytic relationship with the conductive face of the strip, the ends of each set of anode elements being slidably mounted on and in direct electrical contact with an exposed upper surface of a corresponding one of the carbon portions.

ABRAM B. WILSON.

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The following references are of record in the file of this patent:

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