

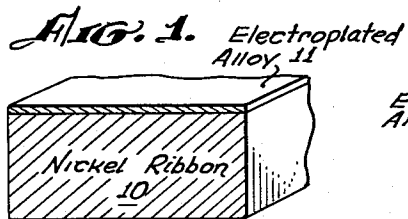
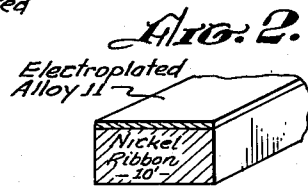
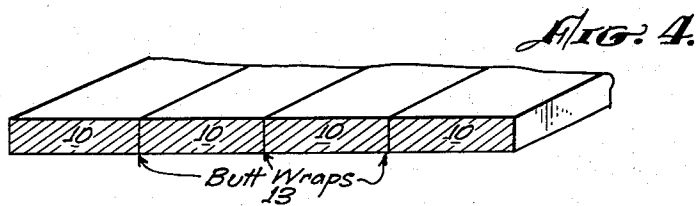
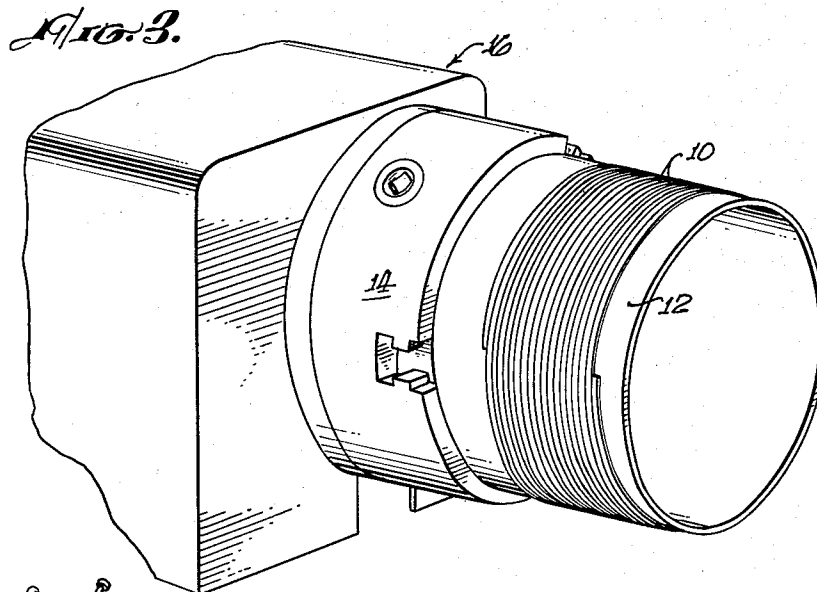
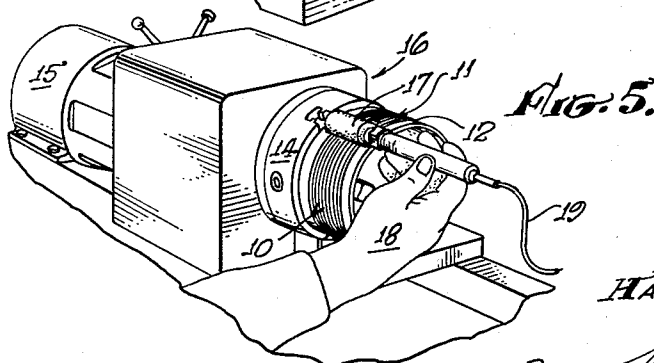
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H. J. DE NAULT

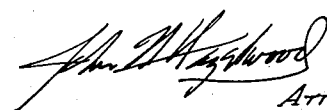
3,259,556

RIBBON ELECTROPLATING METHOD

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RIBBON ELECTROPLATING METHOD

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5 Claims. (Cl. 204-27)

This invention relates to the art of electroplating, particularly to a method for electroplating a metal ribbon, and more particularly to a method of electroplating only one surface of a flat metal ribbon.

When attempting to electroplate a metal alloy onto one side of a thin flat metal ribbon, it has been difficult to prevent plating of portions or all of the remaining three sides by the prior known methods.

Therefore, an object of this invention is to provide a method for electroplating a metallic ribbon.

Another object of the invention is to provide a method for electroplating one surface of a ribbon.

Another object of the invention is to provide a method for electroplating one surface of a flat metal ribbon with a metal alloy without plating any portion of the other surfaces of the ribbon.

Other objects of the invention will become readily apparent from the following description and accompanying drawings wherein:

FIGS. 1 and 2 show enlarged cross-sectional views of a ribbon plated in accordance with the invention;

FIG. 3 is a perspective view showing the ribbon wound on a mandrel;

FIG. 4 is an enlarged cross-sectional view of the ribbon as wound on the mandrel illustrated in FIG. 3; and

FIG. 5 is a view showing the plating of the ribbon on the mandrel.

Broadly, the invention relates to a plating process for coating one surface only of wire strip material. The material is wound tightly about a rotating mandrel or work holder, with each coil abutting the adjacent coil so that leakage of plating solution through the strands is minimized. After an electro-cleaning step the strip is brush plated electrolytically on its outer surface, and finally removed from the work holder. The electro-cleaning step involves anodic and cathodic treatment prior to plating (the workpiece being the cathode during plating).

Referring now to the drawings, the ribbons 10 and 10' illustrated in FIGS. 1 and 2, respectively, may be nickel or another suitable metal. An example of the dimensions of the ribbon illustrated in FIG. 1 might be 0.030 x 0.012 inch while the FIG. 2 ribbon might be 0.015 x 0.006 inch, thus illustrating the smallness of the material being plated. Ribbons 10 and 10' are shown as being plated with a metal alloy 11 of a thickness for example of 0.000025 inch, the properties of metal alloy 11 being determined by the specific requirements.

Referring now to the method of plating only one surface of the ribbon, the metal ribbon 10 or 10' is butt-wound or wrapped on a suitable cylindrical mandrel 12 (see FIG. 3) with sufficient tension and pressure to minimize the flow of electro-plating solution between the butt wraps indicated at 13 in FIG. 4. As illustrated in FIGS. 3 and 5, cylindrical mandrel 12 is mounted in a clamp means 14 rotated by a motor 15 via gearing and drive mechanism indicated generally at 16, the speed of rotation of mandrel 12 being controlled by mechanism not shown. The ribbon 10 is then plated through the use of a conventional "brush plating" technique wherein, as illustrated in FIG. 5, a plating brush 17 is held by an operator indicated at 18, the brush 17 being connected to

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suitable source of electrical power via lead 19 and functioning as the anode while the workpiece (ribbon 11) and mandrel 12 function as the cathode during plating. The mechanism for controlling the electrical flow through brush 17 is conventional and therefore not shown. A detailed description of an example for carrying out the plating process is as follows even though certain of the steps can be omitted without departing from the invention:

(1) Wind the nickel ribbon 10 or 10' on mandrel 12, holding 15-20 pounds pressure at the supply drum and 7-9 pounds side pressure (ribbon-to-ribbon contact).

(2) Secure ends of ribbon to mandrel with material such as electro-plater's tape and mask off excess mandrel area.

(3) Determine area to be plated and calculate plating time.

(4) Prepare and plate workpiece by following, in sequence, the steps listed below:

4.1 Abrasively clean with levigated alumina at two pounds pressure.

4.2 Electro-clean and activate, using No. 2 etch solution, 12 volts D.C. reverse current (cathode to anode) to guarantee maximum adhesion of metal to be plated, through a plating anode PR-3 or MR-3.

4.3 Cold water rinse for three minutes.

4.4 Electro-clean with cleanser-deoxidizer solution at 6 volts D.C. forward current (anode to cathode) to remove the oxide picked up in step 4.2.

4.5 Repeat step 4.3.

4.6 While workpiece is still wet from the above operation electro-plate with proper solution.

4.7 Repeat step 4.3.

4.8 Gold strike for identification if desired. If used, plate for 15 seconds with Dalic or Selectron gold solution at 6 volts D.C.

4.9 Remove ribbon and rewind on similar mandrel to expose unplated surface.

4.10 Repeat step 4.1.

4.11 Inspect for adhesion using any of the conventional methods; i.e., tape test, mandrel bend test, etc.

4.12 Inspect for thickness by metalographic or chemical penetration methods.

It has thus been shown that the present invention provides a simple and effective method of electro-plating a metal alloy onto one surface of a flat metal ribbon without plating any portion of the remaining three surfaces of the ribbon. Although the method has been illustrated and described as being manually accomplished, it is within the scope of this invention to carry out the method by automatic apparatus.

Although specific embodiments of the plated ribbon and an apparatus for carrying out the method of the invention as well as specific steps of the method have been illustrated and/or described, modifications thereof may become apparent to one skilled in the art, and it is intended to cover in the appended claims all such modifications as come within the spirit and scope of the invention.

What I claim is:

1. The method of electroplating a metal onto one side only of a flat nickel ribbon comprising the steps of winding the nickel ribbon on a rotating mandrel, securing the ends of the nickel ribbon to the mandrel, abrasively cleaning the ribbon surface to be plated, electro-cleaning and activating the surface to provide maximum adhesion, rinsing the surface, electro-cleansing the surface to remove any oxide from the surface, rinsing the surface, electroplating the surface with the desired solution utilizing the brush plating technique, rinsing the plated surface, and removing the plated ribbon from the mandrel.

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2. The method defined in claim 1 including the additional steps of rewinding the ribbon of a mandrel so as to expose the unplated surfaces, and abrasively cleaning the exposed surfaces.

3. The method defined in claim 1 including the additional step of applying an identifying strike onto the plated surface of the ribbon from a desired solution.

4. The method of electroplating a metal onto one side only of a flat nickel ribbon comprising the steps of: winding the nickel ribbon on a rotating mandrel with sufficient tension and pressure so as to substantially prevent the flow of electroplating solution between the windings, securing the ribbon to the mandrel to prevent unwinding of the ribbon, masking any excess mandrel area, abrasively cleaning the ribbon surface to be plated, electro-cleaning and activating the surface of the ribbon to be plated to provide maximum adhesion, cold water rinsing the surface for a predetermined time, electro-cleaning the surface with a cleanser-deoxidizer solution to remove any oxide from the surface, cold water rinsing the surface for a predetermined time, electroplating the surface of the ribbon with the desired solution utilizing a brush plating technique wherein the brush functions as the anode while the ribbon and the mandrel function as the cathode during plating, cold water rinsing the plated surface for a predetermined time, applying an identifying strike on the plated surface from a gold solution, and removing the plated ribbon from the mandrel.

5. The method defined in claim 4 including the addi-

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tional steps of rewinding the ribbon of a mandrel so as to expose the unplated surfaces thereof, and abrasively cleaning the unplated surfaces of the ribbon.

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