

Jan. 11, 1944.

L. G. BERQUIST

2,338,795

WIRE PLATING APPARATUS

Filed June 29, 1939

3 Sheets-Sheet 2

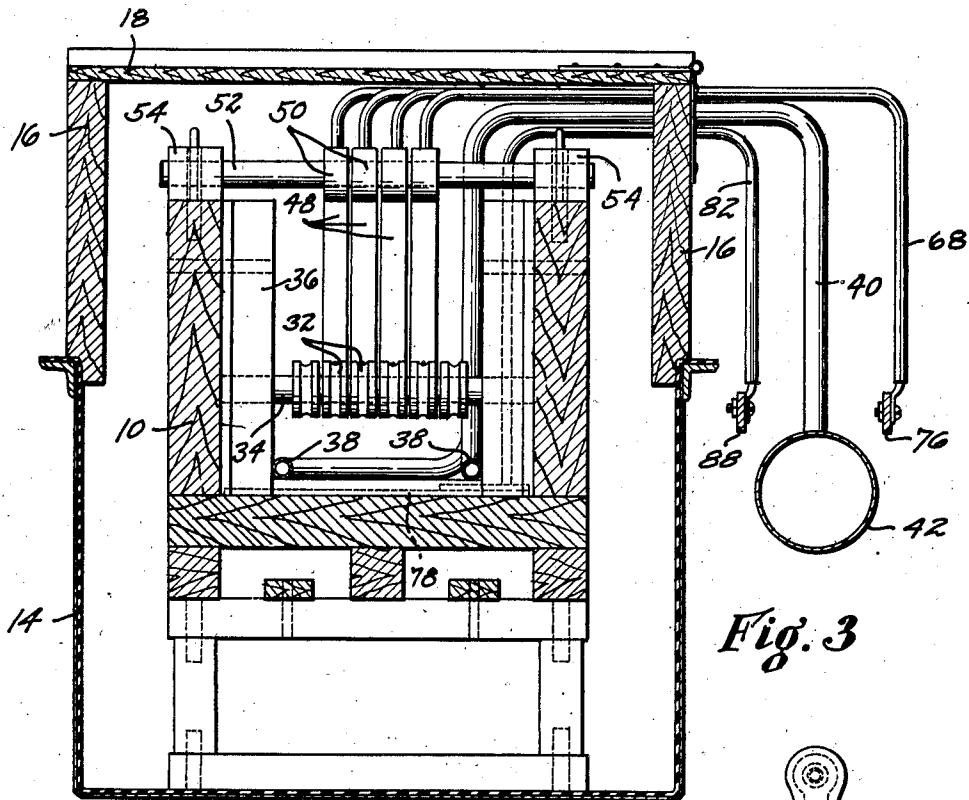


Fig. 3

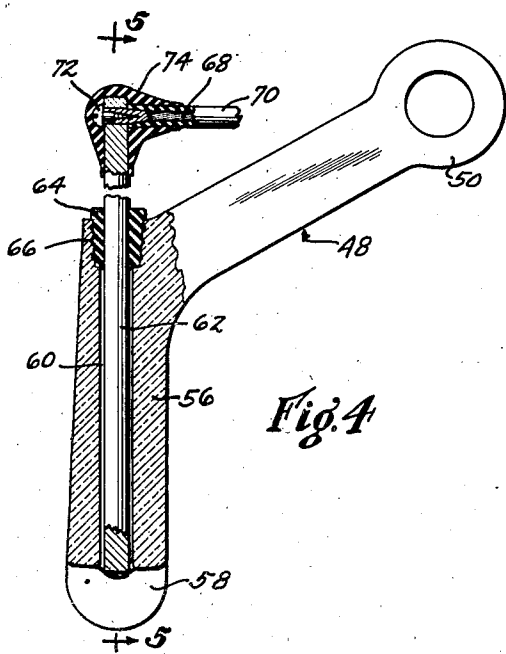


Fig. 4

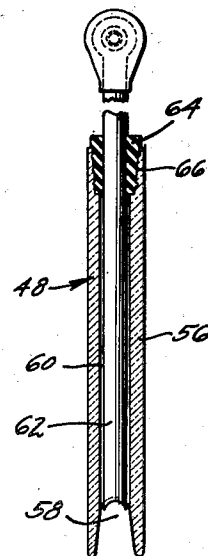


Fig. 5

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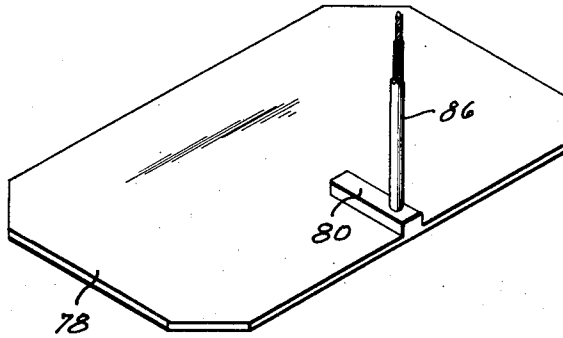


Fig. 6

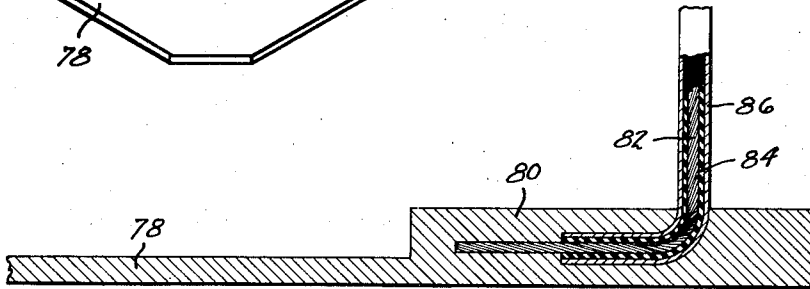


Fig. 7

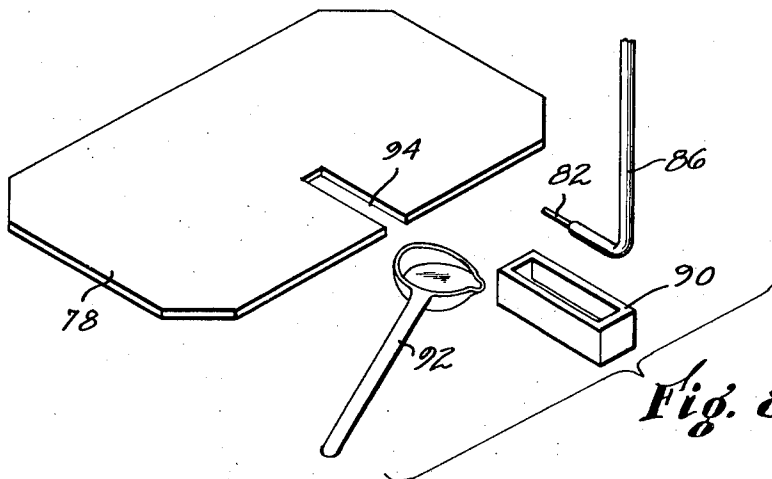


Fig. 8

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UNITED STATES PATENT OFFICE

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WIRE PLATING APPARATUS

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3 Claims. (Cl. 204—206)

This invention relates to wire plating apparatus and more particularly to apparatus for electroplating continuous lengths of wire or the like.

One of the objects of the invention is to provide a wire plating apparatus in which the plating solution is kept agitated at all times. Preferably a tank is employed in which the solution is locally agitated and at the same time a circulation of solution through the tank is maintained.

Another object of the invention is to provide plating apparatus in which the anode of plating material rests on a plate of conducting but non-corrosive material. In this way the anode itself forms the only exposed material in the tank affected by the plating solution and may be replenished merely by dropping bars or ingots into the tank on the plate.

Still another object of the invention is to provide wire plating apparatus in which the wire is electrically energized by a pivotally mounted contactor engaging the wire by gravity. According to one important feature the contactor is constructed almost entirely of non-metallic, non-corrosive material and includes an adjustable contact rod to engage the wire.

Other objects and advantages of the invention including novel sub-combinations and arrangements of parts will be apparent from the following description of the embodiment shown on the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section through a plating tank embodying the invention;

Figure 2 is a plan view of Figure 1 with the top removed;

Figure 3 is an enlarged section on the line 3—3 of Figure 1;

Figure 4 is an enlarged side view with parts in section of a contactor;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 is a perspective view of a contact plate;

Figure 7 is an enlarged transverse section of Figure 6; and

Figure 8 is a perspective diagram illustrating the method of making the contact plate.

The apparatus illustrated comprises an elongated tank 10 formed of wood or other material which is not affected by the plating solution and having ends 12 lower than its sides to limit the level of plating solution therein. The tank 10 is mounted in a second tank 14 shown as formed of metal coated with rubber and which extends

beyond the ends and sides of the tank 10 to receive overflow solution therefrom. As best seen in Figure 3 the tank 14 supports sideboards 16 extending above the tank 10 and closed by a hinged cover 18.

As shown the apparatus is arranged simultaneously to plate four wires which enter the tank 10 at one end in parallel as shown at 20 and pass over pulleys or guide wheels 22. The pulleys 22 are formed of some non-corrosive material such as porcelain and are carried by a shaft 24 of similar material which is mounted at its opposite ends in grooves in wooden blocks 26 which lie against the sides of the tank 10. The wires then pass under a set of pulleys 28 carried by a shaft 30 which is mounted at its ends in the blocks 26 and are led through the tank below the surface of the plating solution therein over spaced sets of pulleys 32 carried by shafts 34 which are mounted in blocks 36. It will be understood that all of the pulleys and shafts are formed of porcelain or like non-corrosive material so that no parts are exposed to the plating solution which will be affected thereby.

According to one important feature, the plating solution is agitated in the tank 10 to insure contact of all parts of the wire with a solution of uniform strength so that a uniformly coated wire will be produced. This is accomplished by providing perforated pipes 38 extending along the tank adjacent the sides and bottom thereof parallel to the wires 20. The pipes 38 have riser portions 40 extending up over the side of the tank 10 and connected to a manifold 42 (Figure 3) leading to a source of compressed air or the like. As shown, several sections or lengths of pipe are provided, each extending a relatively short distance so as to prevent excessive pressure drop through the pipe.

In operation compressed air from the manifold 42 flows into the pipes and through the perforations therein to bubble up through the solution in the tank. This keeps the plating solution agitated along the entire length of the wire so that the wire will be uniformly plated. The solution in the tank 10 is further agitated by providing a pump 44 having its inlet connected to the bottom of the tank 14 and an outlet pipe 46 extending over the side of the tank 10 substantially centrally of the length thereof. In operation the pump withdraws plating solution from the tank 14 and discharges it into the central portion of the tank 10 so that the solution flows lengthwise of the wire and overflows the ends 12

of the tank 10. In this way a constant circulation of the solution along the length of the wire is maintained.

The wire is connected in an electric circuit by novel contactors 48 illustrated in detail in Figures 4 and 5. As shown, the contactors comprise angular bodies of porcelain or the like non-corrosive material having an upper arm terminating in an eye 50 adapted to be pivotally mounted on a transverse bar 52 extending across the top of the tank 10. As shown, the bar 52 is supported in mounting brackets 54 secured to the top of the tank, the bar and mounting brackets being formed of porcelain or like non-corrosive material. The opposite end of the contactor is formed by an arm 56 adapted to extend substantially vertically and terminating at its lower end in a groove 58 formed to fit over or straddle the wire. The arm 56 is provided with a longitudinal bore 60 to receive a contact rod 62 which is preferably formed of some metal which is substantially non-corrosive in the plating solution. One material which I have found to be very satisfactory for this purpose is an iron alloy sold commercially as "Duriron." With this construction the weight of the insulating body and the contact rod 62 acting about the pivotal mounting on the bar 52 holds the contact rod against the wire to be plated.

The rod 62 is secured in place in the bore 60 by means of a sleeve 64 of rubber or other resilient material fitting around the rod 62 and adapted to be wedged into a tapered portion 66 at the upper part of the bore 60; preferably concentric grooves or like roughened portions are provided in the tapered bore 66 to hold the sleeve in place. When the parts are assembled, as shown with the sleeve pressed into place at the tapered bore 66, the sleeve grips the rod 62 and holds it in the bore with its lower end terminating substantially flush with the surface of the groove 58. Thus as the wire moves through the groove, it wipes across the lower end of the rod 62 and makes an electric contact therewith.

The upper end of the rod is connected to one side of an electric circuit through a flexible connection shown as a wire 68 sheathed with rubber or the like 70. The wire 68 is illustrated as extending through an opening in the upper end of the rod and clamped in place by a tapered screw 72 extending through the opening into the end of the wire. The upper end of the rod and the exposed portion of the wire are covered by a rubber covering 74 joining the wire sheath 70 and extending down for a short distance on the rod 62. Thus the only metal exposed to the action of the plating solution is the rod 62 which may be formed of a material affected to a very small extent if at all by the plating solution.

At its opposite end the wire 70 extends through suitable openings in the side board 16 and is connected to a bus bar 76 forming one side of an electric circuit.

The anode circuit, according to the present invention, is formed by one or more lead plates 78 overlying the bottom of a tank 10 and adapted to support suitable bars or ingots of plating material. The plates 78 include at one side an enlarged boss 80 likewise formed of lead and integrally connected to the plate 78. As best seen in Figure 7 a wire 82 of stranded copper or the like extends into the boss 80 to form an electric contact therewith. The wire may be provided with the usual rubber covering 84 and has over its outside a lead sheath 86 which terminates

within the boss 80 so as to prevent access of the plating solution to the wire itself. At its opposite end the wire 82 extends through the side board 16 as best seen in Figure 3 and is connected to a bus bar 88 forming the other side of the electric circuit.

The plate 78 may be formed according to the method illustrated in Figure 8 by stripping a portion of the wire 82 and bending it at an angle as shown. The end portion of the wire may then be placed in a mold 90 and may have molten lead poured thereover from a suitable ladle as indicated at 92. When the lead has cooled a block similar to the boss 80 is formed and may be inserted in a cut-away portion 94 in the plate 78. Thereafter the block and plate may be welded or soldered in any desired manner to form an integral connection therebetween.

In use the plates 78 are placed in the bottom of the tank 10 and bars or ingots of the plating material are placed thereon. This forms an electric connection between the bars or ingots and the bus bar 88. At the same time the contactors 48 form an electric connection with the wire and as the wire is run through the tank it may be plated as is understood in the art. As the bars or ingots of plating material are depleted during operation, they may be replaced merely by dropping additional bars into the tank to rest on the plates 78.

While the apparatus has been particularly described in connection with the plating of wire, it will be understood that rods, beams, or other shapes might be plated in the same manner and that certain features of the invention might be applied to stationary plating tanks in which the articles to be plated are sustained. The particular apparatus described is therefore not intended as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. In wire plating apparatus of the type including a tank adapted to contain a plating solution and means for guiding a wire substantially horizontally through said tank below the level of the solution, the combination of an electrical contactor carried by the tank and engaging the wire, comprising an angular body of non-corrosive non-conducting material including an upper arm and a downwardly extending vertical arm, said body being pivotally supported at its upper end adjacent the outer end of its upper arm and formed at the lower end of its vertical arm with a groove to straddle the wire and having a passage extending through said other arm and opening into said groove, and a metallic rod connected at its upper end to a source of electric power and extending loosely through said passage and terminating adjacent the surface of the groove to contact the wire, the point of contact of the rod and wire being vertically offset from the pivotal mounting of the upper arm, the end of the metallic rod being held against the wire by the weight of the rod and of said body acting about the pivotal mounting of the member.

2. In wire plating apparatus of the type including a tank adapted to contain a plating solution and means for guiding a wire substantially horizontally through said tank below the level of the solution, the combination of an electrical contactor carried by the tank and engaging the wire, comprising an angular body of non-metallic non-conducting material including an upper arm and a downwardly extending vertical arm

said body being pivotally mounted above the wire at the outer end of its upper arm and having its other arm extending substantially vertically downward into the tank, the lower free end of the other arm being formed with a groove to straddle the wire and having a bore lengthwise therethrough opening into said groove, a metallic rod extending loosely through said bore and terminating adjacent the surface of said groove to contact the wire and connected at its upper end to a source of electric power, the point of contact of the rod and wire being vertically offset from the pivotal mounting of the upper arm and a yielding sleeve surrounding the rod engaging the upper end of said bore to hold said rod in place in the bore.

3. In apparatus for the electrochemical processing of a moving wire, including a tank adapted to contain electrolyte, and means or guiding the wire substantially horizontally through said tank below the level of the electrolyte; the com-

bination therewith of an electrical contactor comprising an angular body of insulating material including an upper arm and a downwardly extending vertical arm, said body being pivotally mounted above the wire at the outer end of the upper arm, the other arm providing a sleeve of insulating material having a grooved lower end straddling said wire, a rod of conducting material loosely extending through said sleeve, the lower end of said rod being exposed in the groove to contact the wire, the upper end of said rod being connected to a source of electrical power and the point of contact with said wire being vertically offset from the pivot point so that a gravitational force yieldingly presses said rod against the wire, and a collar of yielding material surrounding and frictionally gripping the rod and engaging the sleeve at its upper end to hold the rod in place in the sleeve.

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