June 30, 1925. 1,544,027

J. J. MUELLER, JR

PLATING DEVICE

Filed Feb. 1, 1923 2 Sheets-Sheet 1

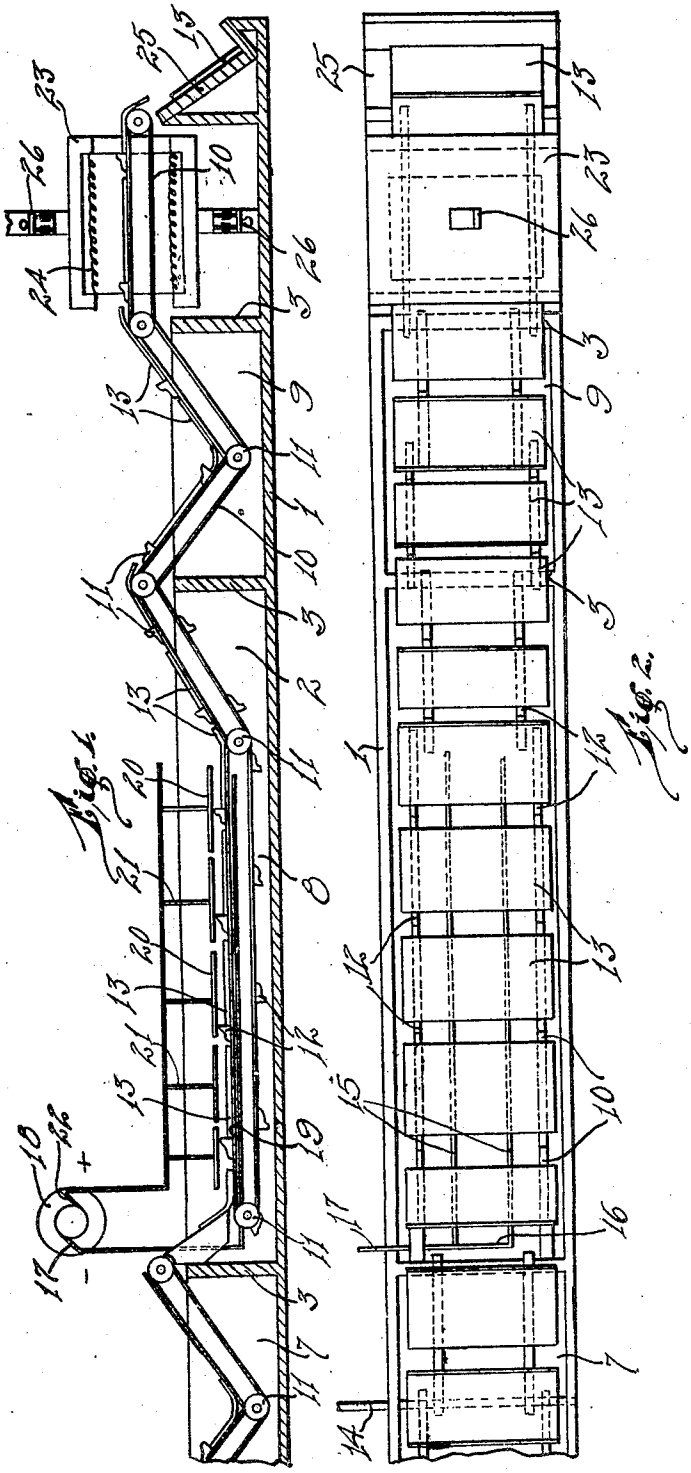


Fig. 1.

Fig. 2.

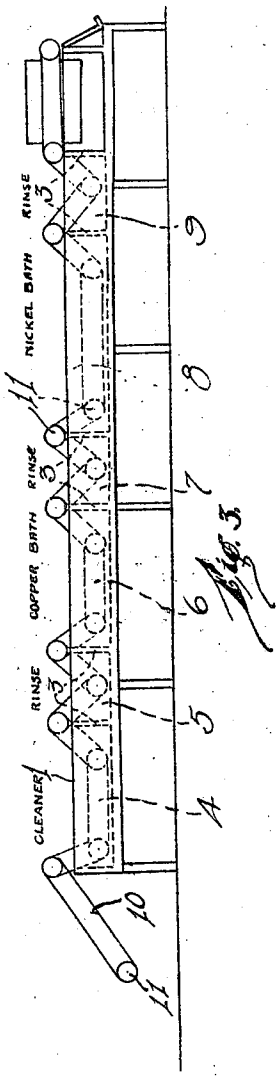


Fig. 3.

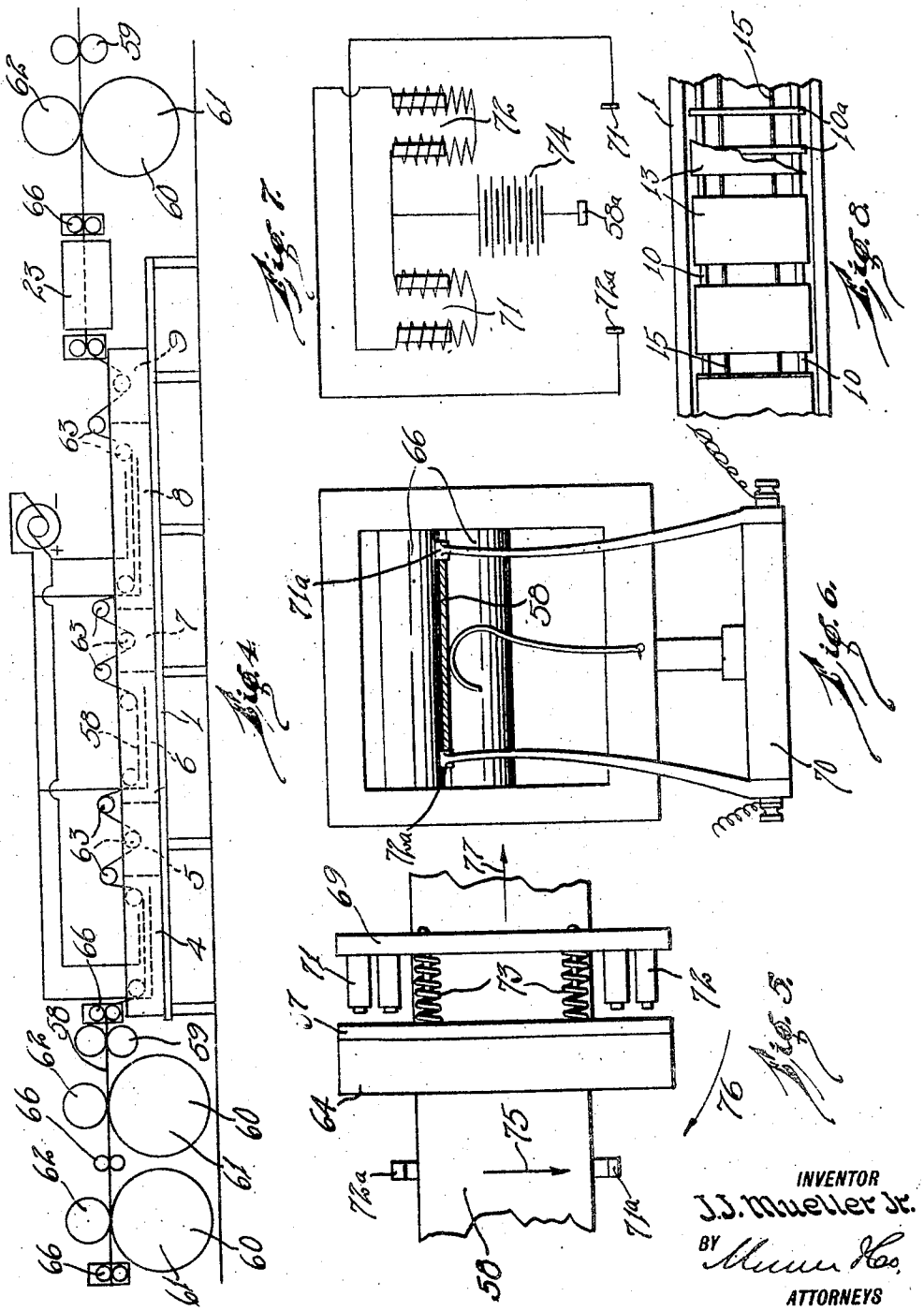
INVENTOR
J. J. Mueller Jr.
BY Munn & Co
ATTORNEYS

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PLATING DEVICE

Filed Feb. 1, 1923 2 Sheets-Sheet 2



Patented June 30, 1925. 1,544,027

UNITED STATES PATENT OFFICE.

JOHN J. MUELLER, JR., OF OTTAWA, ILLINOIS.

PLATING DEVICE.

Application filed February 1, 1923. Serial No. 616,357.

To all whom it may concern:

Be it known that I, JOHN J. MUELLER, Jr., a citizen of the United States, and a resident of Ottawa, in the county of La Salle and State of Illinois, have invented a new and useful Improvement in Plating Devices, of which the following is a full, clear, and exact description.

My invention relates to improvements in plating devices, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide a device of the character described in which metal plates or strips may be cleaned and plated in a continuous operation and by a single machine.

A further object of my invention is to provide a device of the character described in which the cathode in the electroplating bath is in constant motion while receiving a deposit of metal, therefore greatly increasing the speed in which a given deposit may be made on the article or articles to be plated.

A further object of my invention is to provide a device of the character described which is practically automatic in operation, and requires a minimum amount of care.

A further object of my invention is to provide a device of the character described in which a continuous metal strip may be cleaned and plated, and in which means is also provided for obviating the jamming of the strip which might occur by lateral motion thereof from slight irregularities caused by warpage of the strip.

A further object of my invention is to provide a device of the character described that is simple in construction, and which is thoroughly practical commercially.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a sectional view of an embodiment of my invention,

Figure 2 is a top plan view of the mechanism illustrated in Figure 1,

Figure 3 is a diagrammatic view of the entire embodiment of my invention,

Figure 4 is a diagrammatic view of a modified form of my invention,

Figure 5 is an enlarged top plan view of a portion of the mechanism illustrated in Figure 4,

Figure 6 is a front elevation of the mechanism illustrated in Figure 5,

Figure 7 is a diagrammatic view of the electrical circuit employed in the electrically controlled straightening device shown in Figures 5 and 6, and

Figure 8 is a fragmentary view of a modified form of the conveyor belt.

In carrying out my invention, I make use of a table 1 having upwardly extending side walls 2 and partitions 3 therein which divide the upper surface of the table into a plurality of vats.

With reference to Figure 1, the first vat (all of the vats are rendered water-proof by a suitable process) is filled with a cleaning fluid indicated at 4, the second vat 5 with a rinsing fluid, the third vat 6 with a copper plating bath, the fourth vat 7 with a rinsing fluid, the fifth vat 8 with a nickel plating bath, and the sixth vat 9 with a rinsing fluid. It should be understood of course that if the metal is not to be nickel plated, any other plating bath, such as silver, gold, or the like, may be substituted for the nickel plating bath. A plurality of endless belts 10 are operatively supported upon rollers 11 so that they all move simultaneously, certain of the endless belts 10 being disposed in each of the vats, respectively. It will be seen from an inspection of Figure 2 that the arrangement of the endless belts is such that an object placed thereon will travel and be carried progressively through all of the vats containing fluids 4 to 9 inclusive. Each of the endless belts 10 is provided with upwardly extending lugs 12 at regular intervals thereon so that a plate, such as the plate 13, upon which it is desired to deposit a plating of metal, may be carried through each of the fluids 4 to 9 progressively as the belts are in operation. Ordinarily, I prefer to drive the belts from a central shaft, such as shown at 14, and when one is driven, the entire group of belts, as described, will move simultaneously.

Each of the electroplating baths 6 and 8, i. e., the copper bath and the nickel bath, is provided with a pair of metal rails 15 which extend longitudinally of the bath at spaced distances one from another and which are electrically connected by means of conductors 16 to the minus pole 17 of a direct cur-

rent generator 18. The rails 15 are disposed very slightly above the upper portion 19 of those endless belts 12 which are disposed in the vats containing the fluids 6 and 8, respectively, and intermediate the belts. An inspection of Figure 2 will show that the belts are link belts and there are two to a section, one parallel to the other. The plates 13 therefore make sliding contact with the rails 15 as they are moved along by means of their engagement with the upwardly extending lugs 12 on the belts 10. The plates 13 in this case form the cathode. The anode of the plating bath comprises a plurality of plates 20 of the metal that it is desired to deposit upon the plates 13. The plates 20 are electrically connected by means of conductors 21 to the positive pole 22 of the generator 18.

Means for drying the plates 13 when the plating and rinsing operations are performed, is provided in a dryer 23 having electric heating coils 24 therein and through which one of the pairs of link belts 10 moves. The plates 13 are thoroughly dried as they pass through the dryer 23 and an inclined tray 25 is provided at the outer end of the dryer upon which the plates 13 may be delivered as they pass over the open end of the adjacent belt 10. Switches 26 are provided for controlling the electric heating unit 24 of the heater should the interior of the heater become too hot.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. In using my device, the plates 13 are placed upon the adjacent conveyor belt 10, and will be moved up over their associate rollers through the vat in which the cleaning fluid 4 is disposed, and from thence through the vat in which the rinsing fluid 5 is disposed. The plates will then be carried from the rinsing bath to the copper plating bath 6 to the next adjacent bath. The plates while in this bath will constitute the cathode of the electroplating bath and will be electrically connected to the generator 18 by means of the rails 15 upon which the plates make sliding contact as they move through the vat upon the adjacent link belt 10. The anodes of the plating bath, which in this case are copper plates 20, are disposed directly over the plates and are connected to the positive pole of the generator 18.

From the copper bath the plates are carried by means of the link belts 10 through the next adjacent vat containing the rinsing fluid and from thence into the nickel plating bath 8. Again the plates 18 are made the cathode and are in electrical connection with the generator 18 by means of the rails 15 (see Figures 2 and 3) which are connected to the negative pole of the generator as they pass through the vat on the belts 10. The anodes are nickel bars, such as the bars 20, which are electrically connected with the positive pole of the generator and disposed directly above the plates 13. When the plates 13 have been passed through the nickel plating bath, they are carried by the conveyor belts 10 into the next adjacent bath in which rinsing fluid is placed and from thence through the dryer 23. The heating coils 24 in the dryer serve to produce heat sufficient to thoroughly dry the plates which are then delivered over the remote end of the link belt 10 into a suitable tray 25.

One of the important advantages of my present device is that the actual time required to place a given deposit of metal upon the plates 13 is greatly reduced. This is caused by the fact that the plates 13 are in motion constantly while in their plating bath, and it has been found by experience that when the cathode is in motion in the bath, a deposit of metal thereon is greater in a given time.

Referring now to Figure 4, I have shown a modified form of my invention in which in place of employing link belts 10 for conveying the plates through the successive baths and rinsing fluids, I place metal to be plated through the device in a continuous strip. If the metal be first had in short strips, I secure the plates one to another by means of soldering, welding, or any other well known process for securing one plate to another, without eliminating the electrical contact of one plate to another.

In the mechanism shown in Figure 4, I employ one or two grinding, polishing, or buffing devices 60, and in the present form I choose to employ two so that the strip is thoroughly free from any scale or other deposit. The device 60 comprises a roller 61, a grinding polishing, or buffing wheel 62, the plate 58 being arranged to pass between the wheels 62 of the roller 61. The roller 61 is driven of course by any suitable means, such as a small electric motor or the like. It should be understood at this time that the strips may be run through an electrolytic cleaning fluid prior to passing through the polishing or buffing devices 61, but this particular preparation is not actually essential to the carrying out of my invention.

As the continuous strip of metal plates, which I have designated at 58, passes through the cleaning devices 60, they pass through a pair of wiper rolls 59 which are disposed adjacent the table 1. The contents of the vats 4, 5, 6, 7, 8, and 9 is precisely the same as that described in the preferred form of the device and the dryer 23 operates precisely the same as the dryer previously described. I also provide a polishing or buffing device 60 similar to that

previously described at the end of the machine, i. e., that end adjacent to the dryer 23.

It is a well known fact that metal strips, such as zinc strips fastened together in the manner I have described, may possess certain irregularities brought about by warpage of the strips, and which would tend to cause the continuous strip 58 to move laterally as it passes through the machine. To obviate this tendency of the strip 58 to bind in the rollers by movement laterally between the rollers 63 under and over which the strip 58 passes as it moves through the device, I provide a straightening mechanism which I have illustrated in Figures 6, 7, 8, and 9. This straightening mechanism comprises a frame 64 which is pivotally mounted at 65 to a suitable supporting base. The frame 64 is provided with a pair of associate rollers 66. An iron armature 67 is disposed along the top portion 68 of the frame 64, as shown in Figure 7. The supporting piece 69 is supported upon the base 70 which also serves as a support for the pivotal mounting means 65, and a pair of electromagnets 71 and 72 are mounted upon the supporting strips 69. A pair of springs 73 are disposed intermediate the strips 69 and the frame 64 so that the frame 64 tends to yieldably remain in a plane parallel with the strips 69. This straightening device is an electrically controlled device and the circuit therefor I have illustrated in Figure 7.

With reference to Figure 7 it will be seen that I employ a battery 74, one pole of which is connected to the terminals of each of the magnets 71 and 72. The other pole is connected to a contact member 58^a which member is arranged to constantly bear against the strip 58. A pair of contact posts 72^a and 71^a are disposed upon the base 70 and insulated one from another so that their contact portions fall on either side of the strip 58 when the strip is in its normal position and do not contact the strip. The contact plate 72^a is connected to the opposite terminal of the magnet coil 72 and the contact 71^a is connected to the opposite terminal of the magnet coil 71. The operation of the straightening device is as follows. Let us assume that the strip 58 tends to move toward the direction of the arrow 75. The strip 58 will then contact the contact member 71^a and the electromagnet 71 will become energized. As the magnet 71 becomes energized, it will draw the armature 67 thereto and the entire frame 64 will pivot upon its pivotal support 65 in the direction of the arrow 76. The strip 58 which is moving in the direction of the arrow 77 will thereupon be guided in the direction opposite to the arrow 75.

In Figure 8 I have shown a modified form of the conveyor belt 10 in which transverse strips 10^a are supported at each end upon the parallel belts 10 and upon which the plates 13 may be placed. In this modification of the belt, the plates 13 will not slide directly upon the rails 15, but instead the links 10^a will contact and slide upon the rails 15 and electrical contact will be made with the plates through the links 10^a. This modification of my invention is most important where the plates 13 are relatively thin and are not strong enough in themselves to be supported directly upon the parallel belts 10.

I claim:

1. A device of the character described comprising an electroplating bath having an anode, means for conveying portions of a strip to be plated through said bath, and electrically controlled means for guiding said strip in a substantially straight path through said bath, said means comprising a pair of rollers, a pivotally mounted frame for rotatably supporting said rollers, said strip being arranged to pass between and engage with said rollers, and means for automatically turning the frame carrying said rollers when said strip moves of its own accord out of a straight path, whereby said strip may be restored to its proper path.

2. An electrically controlled device for guiding a strip of metal in a substantially straight path and through a plating bath, said device comprising a pair of rollers, a pivotally mounted frame for rotatably supporting said rollers, said strip being arranged to pass between said rollers and engage therewith and electrically operated means for automatically turning the frame carrying said rollers when said strip moves of its own accord, as by warpage, out of a straight path, whereby said strip may be restored to its said straight path.

JOHN J. MUELLER, JR.