Jan. 3, 1939. J. F. TRUDEAU 2,142,829

PLATING MACHINE

Filed Jan. 13, 1936 2 Sheets-Sheet 1

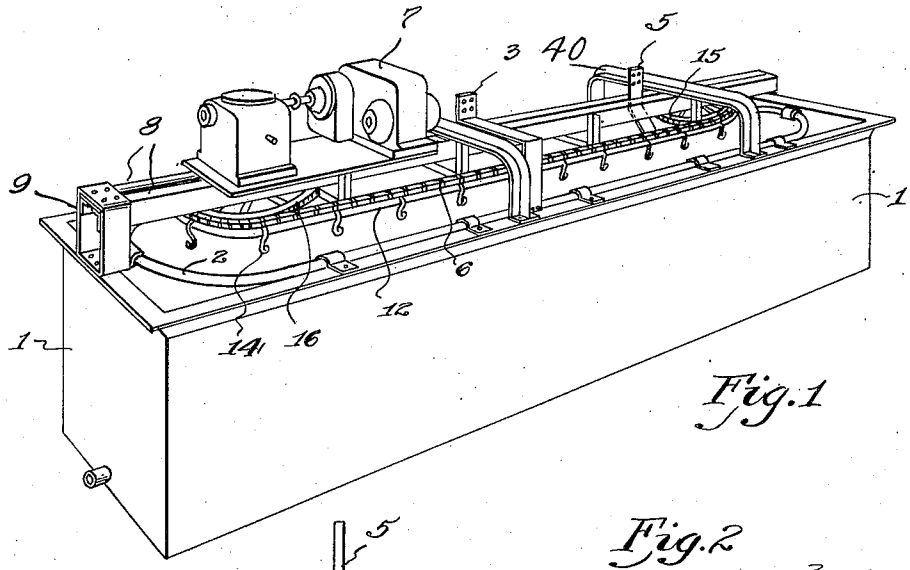


Fig. 1

Fig. 2

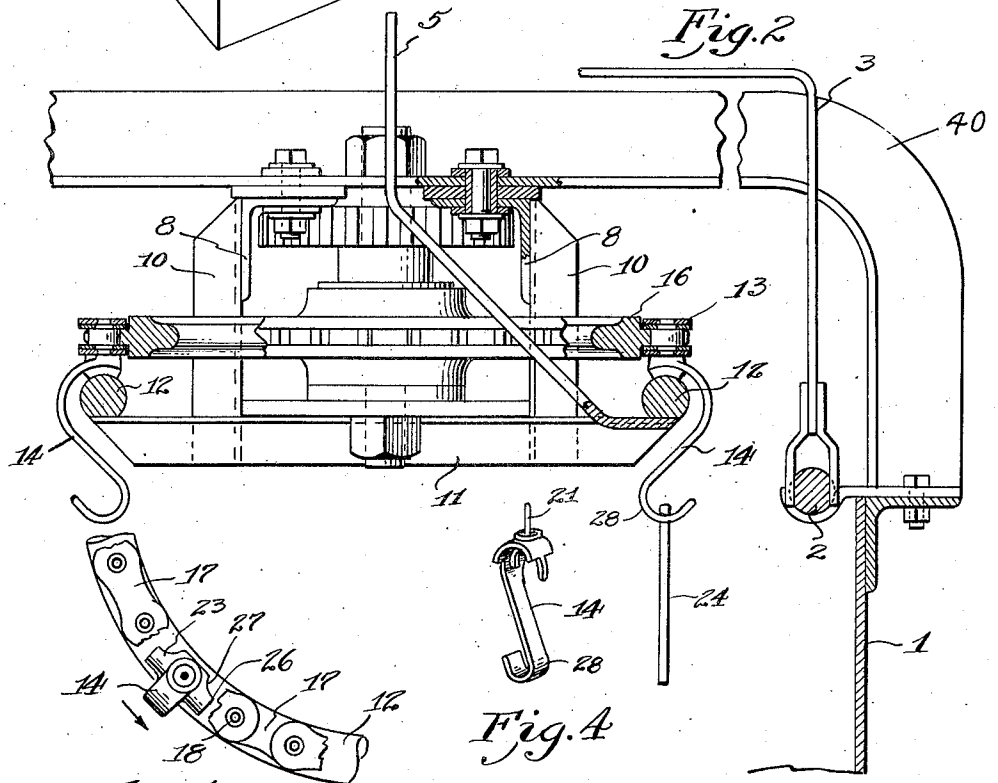


Fig. 3

Fig. 4

INVENTOR.

John F. Trudeau

BY

Barnes, Kisselle, Laughlin & Raisch

ATTORNEYS

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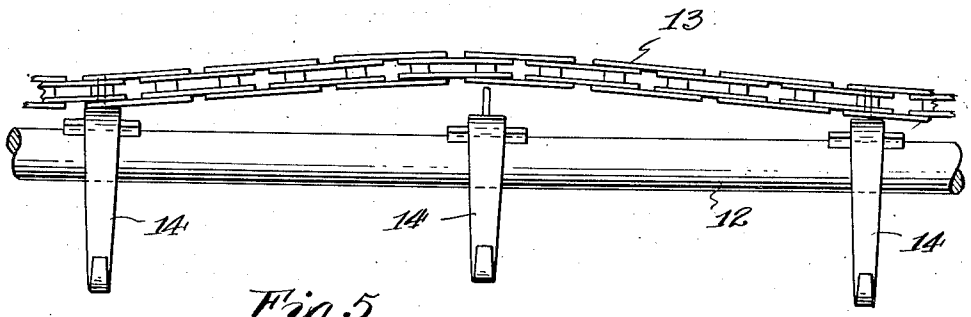


Fig. 5

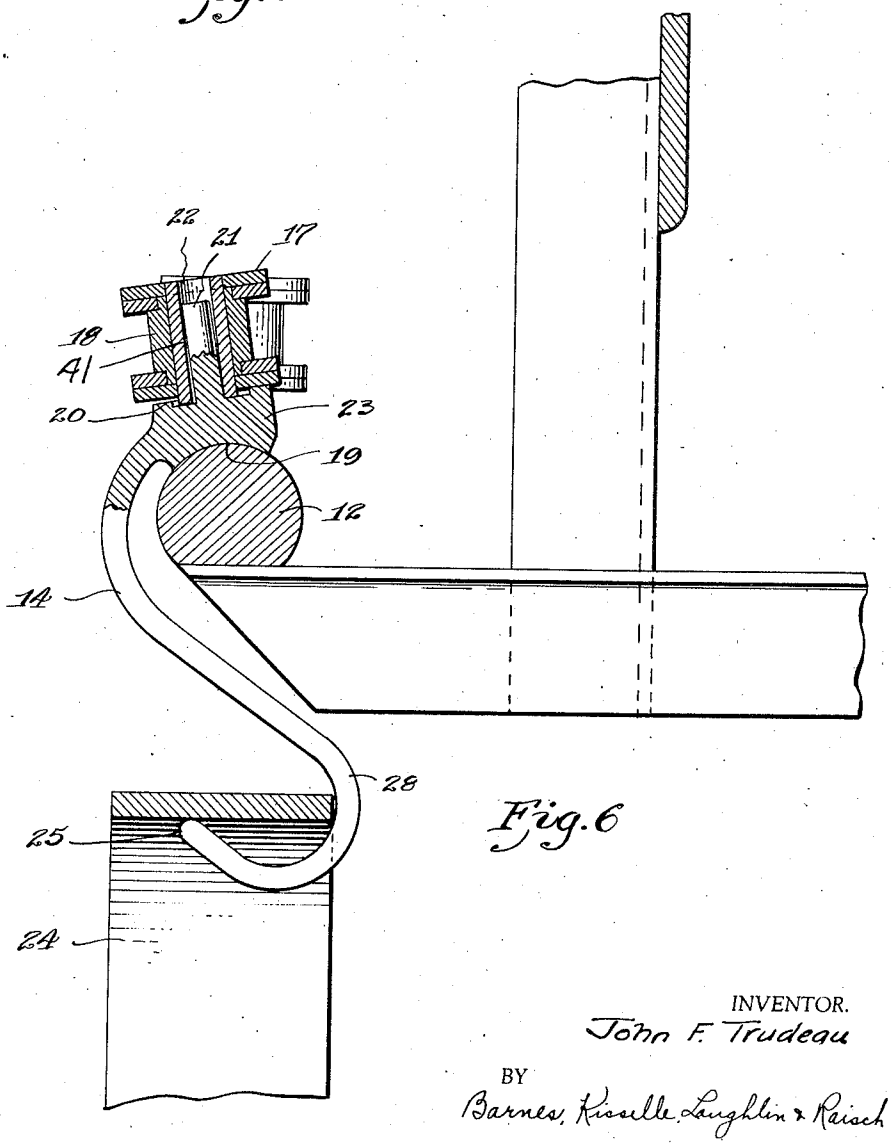


Fig. 6

INVENTOR.
John F. Trudeau

BY
Barnes, Kisselle, Laughlin & Raisch
ATTORNEYS.

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UNITED STATES PATENT OFFICE

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PLATING MACHINE

John F. Trudeau, Detroit, Mich., assignor to Udylite Company, Detroit, Mich., a corporation of Indiana

Application January 13, 1936, Serial No. 58,903

6 Claims. (Cl. 204—5)

This invention relates to a plating machine.

This invention is concerned with a plating machine of the type having an endless conveyer for the work so that the unplated work can be loaded upon, and the plated work unloaded from, the conveyer at the same station. In this type of plating machine the conveyer, which is usually in the form of an endless chain, carries with it the work-carriers upon which the work is suspended in the plating bath. Of necessity, different types of work require different spacing of the work-carriers. It is an object of this invention to provide a conveyer and work-carrier arrangement in which the spacing of the work-carriers one from the other may be very readily achieved both when the machine is running as well as when it is not running.

It is also an object of this invention to produce a plating machine which will run very easily and efficiently under full loads. This object has been achieved by so arranging the conveyer, work-carrier, and conveyer track so that no binding will occur between the conveyer and its track during operation of the machine under load. This object has also been achieved by arranging the conveyer and work-carrier so that they are self-adjusting on the straightaway as well as the curved portions of the track.

It is another object of this invention to produce a plating machine which is simple in structure and efficient in operation. This object has been achieved by making a single rail serve both as the cathode rail and conveyer support rail upon which the work-carriers travel having a sliding fit so that the work-carriers continuously wipe the cathode rail to effect a good contact between the cathode rail and work-carriers.

In the drawings:

Fig. 1 is a perspective showing the complete plating machine.

Fig. 2 is a fragmentary vertical section through the machine.

Fig. 3 is a fragmentary detail showing the conveyer and work-carrier in self-adjusted relation with a curved portion of the cathode rail.

Fig. 4 is a detail of the work-carrier.

Fig. 5 is a detail showing the manner in which the work-carriers may be spaced and coupled with the conveyer chain.

Fig. 6 is a detail sectional view through the conveyer and work-carrier showing the conveyer and work-carrier adjusted laterally of the conveyer support rail.

Referring more particularly to the drawings, there is shown a plating machine comprising a tank 1 for the plating solution, an anode rail 2 carried by, and insulated from, the tank 1 for supporting the soluble metal anodes, an anode lead 3, a cathode rail 12, a cathode lead 5, a work conveyer generally designated 6, and a driving mechanism generally designated 7.

The driving mechanism 7 and conveyer 6 may be supported upon the tank by any suitable support. As shown, this support comprises a pair of angle irons 8 supported at one end of the tank by the member 9 and by the support members 40. The angle irons 8 in turn support the depending members 10 which carry the crosswise support members 11 upon which is mounted the cathode rail 12. As shown, the cathode rail 12 is preferably a solid copper rod which is circular in cross-section and which forms an endless loop along which the work travels. In addition to serving as the cathode rail in the cathodic portion of the plating circuit, the cathode rail also serves an additional function, namely, as a rail or track along which the work-carriers and conveyer chain travel and upon which they are supported.

The work conveyer comprises the endless chain 13 and the work-carriers 14. The endless chain 13, as shown, comprises a plurality of links and is mounted over an idler sprocket 15 at one end of the plating tank 1 and over a driving sprocket 16 at the other end of the plating tank. The sprocket 15 is journaled in suitable support bearing carried by the angle irons 8. The driving mechanism 7 may be of any suitable make and comprises an electric motor and gear reduction transmission which are connected in driving relation with the sprocket 16 in any of the well known ways.

The endless chain 13 comprises a plurality of links 17 which are swivelly connected by the hollow studs 41 and bushings 18 so that the chain is flexible. The hollow studs 41 have a press fit connection with the outer link members 17 and the bushings 18 have a press fit with the inner link members 17. The bushings 18 are freely rotatable about the studs 41. The chain is unguided and unsupported except through the work-carriers 14. The work-carriers 14 comprise a head portion 23 and a hook portion 28 for engagement with the work, either directly, or indirectly through an additional work-carrier. The underside of the head portion 23 forms a bearing surface 19 which is curved and preferably cylindrical or arcuate in form so that it will contact throughout its entire area with the cylindrical surface of the cathode rail 12. The upper face of the head 23 forms a bearing surface 20

upon which the conveyer chain 13 is supported. The head 23 also carries a pin 21 which is arranged to project into an axial opening 22 in the hollow stud 41 of the chain. The pin 21 preferably has a floating fit in the opening 22 and to this end a small clearance of about $\frac{1}{16}$ of an inch is provided between the pin 21 and opening 22.

As shown in Fig. 2, the work 24 will normally be supported on the hook 28 so that a vertical plane passing through the point at which the work is supported upon the hook 28, the longitudinal axis of the cathode rail 12, and the vertical longitudinal axis of the pin 21 will bisect the bearing 19 so that one half of the bearing 19 will lie on each side of the longitudinal axis of the cathode rail 12. In Fig. 6, for illustrative purposes, the work 24 is mounted on the end 25 of the work-carrier hook 28 thereby swinging the work-carrier 14 several degrees in a counter-clockwise direction about the cathode rail 12, but since the bearing 19 has a cylindrical surface there will be no binding between the bearing surface 19 and the cylindrical surface of the cathode rail 12. Although in actual practice the work 24 would not be mounted on the end 25 of the work-carrier 14, the showing in Fig. 6 illustrates the fact that the work-carrier can be swung about the cathode rail 12 through several degrees due to the flexibility of the chain 13 and at the same time no binding will occur between the work-carrier bearing 19 and the cathode rail 12. In those instances where the work swings the work-carrier but a few degrees more or less, the floating fit permitted by the clearance between the pin 21 and socket 22 will permit this swing without flexing the chain 13. However, where the work swings the holder through several degrees, the pin 21 will contact the face of the socket 22 and thereby flex or cant the chain 13, as shown in Fig. 6. However, it will be noted that this canting of the chain will not in anywise cause any binding between the fixed cathode rail 12 and the bearing surface 19 of the holders 14. In the fabrication of a long rod such as the cathode rail 12, it is difficult to make it perfectly straight. Also during the operation of the plating machine while traveling around the curved ends of the cathode rail the work-carriers have a tendency to swivel about the cathode rail. As the chain 13 leaves either of the sprockets 15 or 16, it has a tendency to follow the sprocket or move inwardly of the cathode rail thus again causing the work-carriers to swivel about the cathode rail 12. The floating mounting of the work-carriers 14 upon the cylindrical cathode rail 12 prevents any binding due to any of the above-mentioned conditions obtaining in this type of a plating machine.

As shown in Fig. 5, the carriers 14 can be very easily coupled or uncoupled with the chain 13 both while the chain 13 is in motion as well as when it is at rest by merely raising the chain upwardly and inserting the pin 21 into the socket 22 or removing the pin 21 from the socket 22. This simple coupling relation between the carriers 14 and the chain 13 permits the operator to very easily space one carrier from the other whatever distance required or desired depending upon the nature of the work being plated.

Since the cathode rail 12 also serves as a support rail for the carriers 14 and the chain 13, the structure of the machine is simplified in that the need for an additional cathode rail and contact for the work-carriers is obviated. At the same time the work-carriers 14, as they slide along the rail, wipe its surface and continuously effect an excellent electrical contact with the rail.

It will be noted that the work-carriers 14 are the sole support and guides for the chain 13. The carriers 14 in effect serve as shoes which support the chain 13 and slide along the cathode rail 12. Due to the fact that the bearing surface 19 is cylindrical or arcuate to conform to the cylindrical surface of the cathode rail 12, the chain is kept in alignment with, and above, the cathode rail 12 and this arcuate bearing contact between the cathode rail and work-carrier head 23 prevents lateral displacement of the chain 13 to one or the other side of the rail 12. The length of the bearing surface 19 will be determined by various factors, one in particular of which is the radius of the arc of any curve in the cathode rail 12 which the bearing 19 must negotiate. Of necessity, the length of the bearing 19 should be sufficiently short so that when it travels along a curve, as shown in Fig. 3, it will not dig in to the inside face of a curve in the cathode rail 12. Preferably, as shown in Fig. 3, the head 23 of the work support is curved rearwardly from its leading point or edge 26 and inwardly as at 27. The leading point or edge 26 is in a plane which bisects the arcuate bearing surface 19. Thus, as the carrier travels in the direction of the arrow, Fig. 3, the portion of the bearing surface 19 on the inside portion of the curve on the cathode rail will not dig in.

I claim:

1. In an electroplating machine, a rail, a plurality of work-carriers supported upon, and arranged to travel along, the said rail, a flexible chain for moving the said work-carriers along the said rail, said chain being freely movable upwardly from said rail, and a coupling between the work-carriers and the chain freely disconnectable by moving the chain upwardly from the said rail.

2. In an electroplating machine, a rail, a plurality of work-carriers supported upon, and arranged to travel along, the said rail, a flexible chain for moving the said work-carriers along the said rail, said chain being freely movable upwardly from said rail, a pin and socket coupling between the said work-carrier and chain whereby the work-carrier can be easily disconnected from the chain by moving the chain upwardly from the rail to withdraw the pin from the said socket.

3. In an electroplating machine, a rail, a plurality of work-carriers supported upon, and arranged to travel along, the said rail, a flexible chain for moving the said work-carriers along the said rail, said chain being freely movable upwardly and away from said rail, a pin carried by the said work-carrier, and a socket in the said chain arranged to receive the said pin whereby the said pin is operatively connected in driving relation with the said work-carriers and freely disconnectable by moving the chain upwardly.

4. In a plating machine, a rail, a work-carrier slidably mounted upon the said rail and freely movable transversely of said rail, a flexible chain supported by the said work-carrier for propelling the work carried along the said rail, said chain being freely movable upwardly from said rail, and a floating separable connection between the said chain and work-carrier whereby the said work-carrier can swing laterally about the said rail within the limits of the floating connection without canting the said conveyer chain and said chain can be disconnected from said work carrier by moving the chain upwardly.

5. In an electroplating machine, a rail, a flexible chain mounted above the said rail and freely movable upwardly from said rail, a plurality of work-carriers slidably mounted upon the said rail between the chain and rail, disconnectable pin and socket connections between the said chain and work-carriers whereby the chain propels the work-carriers along the rail, the said chain being flexible whereby the same can be raised above the said rail to disconnect the pin and socket connections between the said work-carriers and chain and permit the work-carriers to be moved along the said cathode rail to change their spacings, the movement of the chain back toward the rail serving to reconnect the pin and socket connections between the chain and the work-carriers.

6. In an electroplating machine, a rail, a flexible chain mounted above the said rail comprising a plurality of links and pins for swivelly connecting the said links, each of said pins having an opening therein, a plurality of work-carriers slidably mounted upon the said rail between the chain and the rail for supporting the said chain, each of the said work-carriers having a pin arranged to engage an opening in one of the pins of the said chain whereby the said chain can be moved away from the said support rail to withdraw the work-carrier pin from the opening in the said chain and thereby permit the spacing between the carriers to be changed, the movement of the chain toward the rail serving to reinsert the work-carrier pin in an opening in one of the chain pins to reconnect the carrier and the chain.

JOHN F. TRUDEAU.