July 7, 1970 F. B. KARLQUIST 3,519,548

PLATING SYSTEM

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FIG. 1

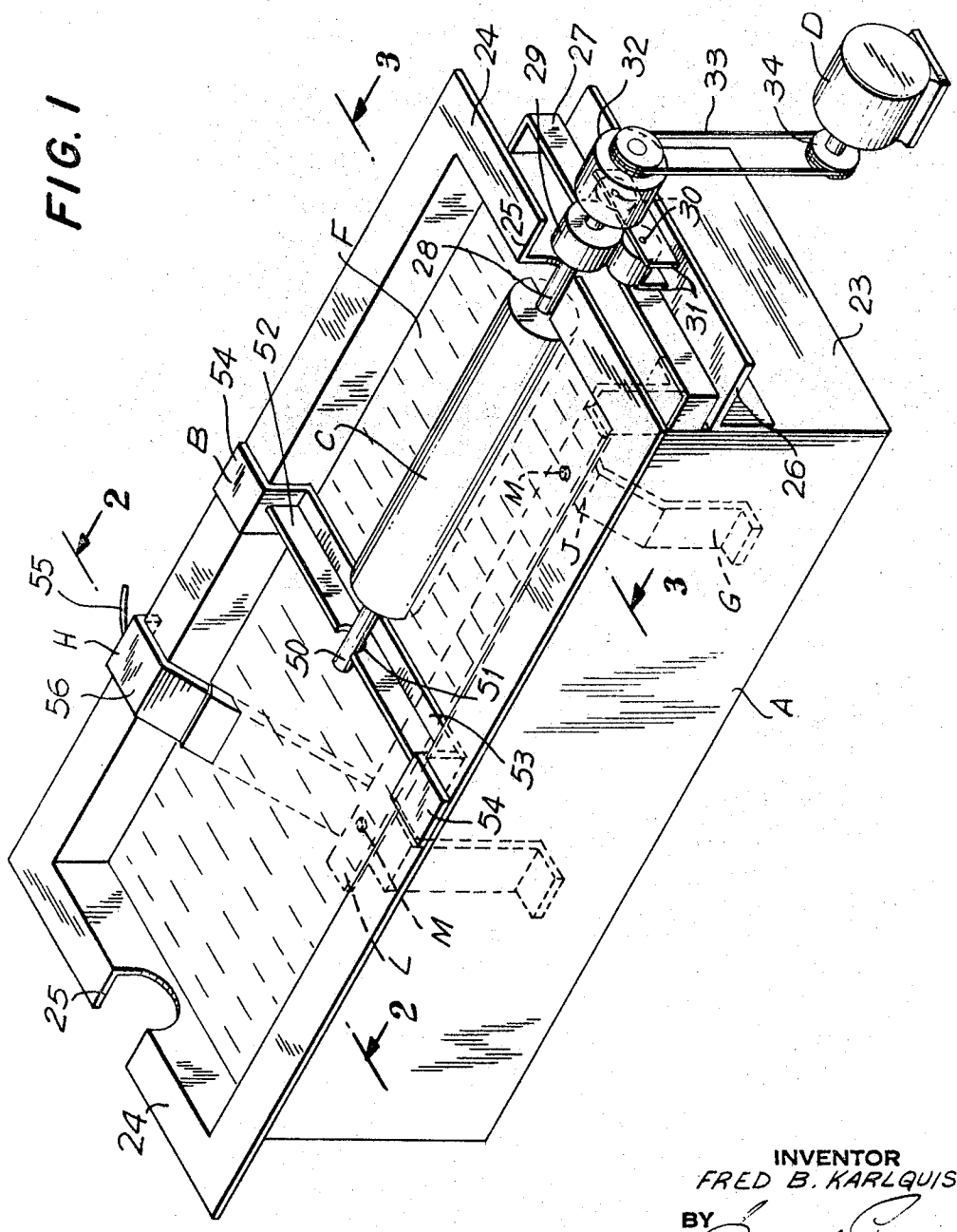

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FIG. 2

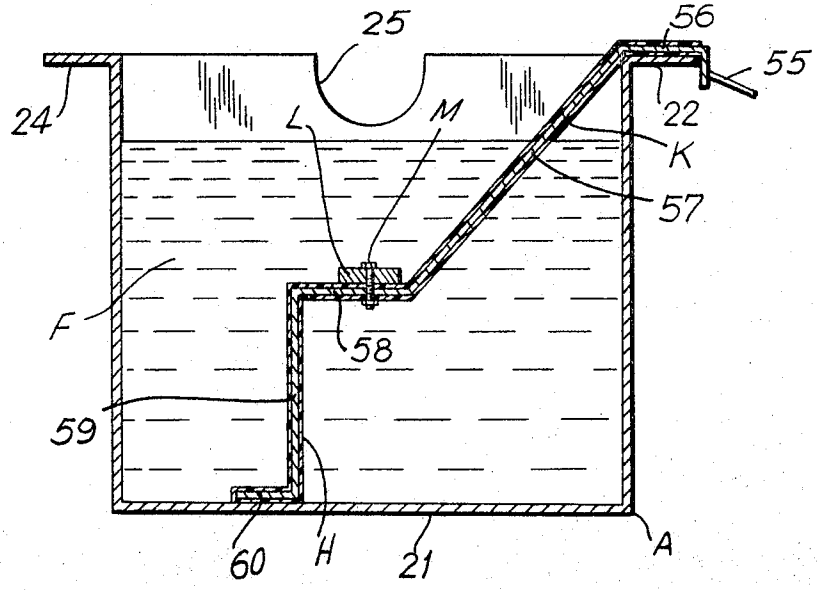
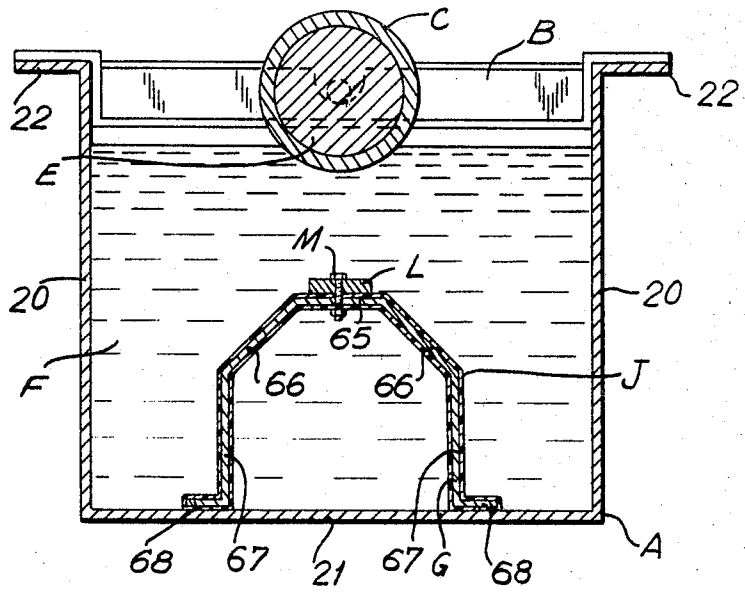


FIG. 3



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PLATING SYSTEM

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ABSTRACT OF THE DISCLOSURE

A plating system for electroplating rollers, the system comprising a tank having a rounded notch in one end wall to support one trunnion of the roller and a notched bracket to support the opposite trunnion. The U-shaped notched bracket is supported from the two opposite tank side walls in a slideable relationship therewith by two flanges positioned so that the trunnion notch will be substantially at the same level with the end wall notch. An anode is provided having an elongated body section with three supporting feet and one upward-extending obilque and insulated contact leg hooking over the tank edge. The roller is immersed only about 20 to 30 percent and the elongated anode section is positioned directly below the roller at a distance of one half to two times the diameter of the roller. The roller is sequentially plated and then exposed to air.

The present invention relates to a plating system and it particularly relates to a system for copper or chromium plating particularly applicable to printing and embossing rollers.

It is among the objects of the present invention to provide a novel plating system in which a roller, whether used for printing, engraving or embossing, may be satisfactorily plated with a metal such as cadmium, copper or chromium with assurance that there may be effective use of the available metal in the bath and with assurance that a coherent, uniform plating will be achieved.

It is also among the objects of the present invention to provide a plating apparatus in which adequate control is provided over the course of the plating operation with assurance that a satisfactory coherent, uniform plating will be achieved in a minimum of time and with minimum labor and with assurance that a most satisfactory plated product will be achieved.

Other objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects it has been found most satisfactory to support a roller being plated in a bath so that only 10 to 40% of the roller surface is immersed in the bath at any time and desirably only 20 to 30% of the circumference of the roller is immersed, with the balance of the roller being exposed to the air during its rotational period.

During its plating operation the roller is driven at a predetermined speed or velocity and the roller is positioned directly above the metal bar immersed in the aqueous bath which supplies the plating metal to the bath.

Desirably this metal bar, which is positioned in the bath directly below the axis of the rotating cylinder being processed, is separated from the roller by between one half and two times its diameter.

The electrode which carries the bar is desirably adjustable longitudinally of the plating tank to adjust the

spaced relationship. Desirably, the copper electrode for a normal plating cylinder may have a size of about 1½" in thickness to 5" in width and it is positioned midway of the depth of the bath and serves as an anode in a copper cyanide solution.

The plating may be controlled to provide a coating of copper ranging from .005" to .025" and preferably .015" and with chromium the plating may vary from .001" to .005" with a preferred thickness at .0005".

With a copper plating bath and a roller, for example between 1,000 and 2,000 pounds, for each 1,000 pounds of roller the bath may contain 5 to 10 pounds of copper in the form of a plating solution such as copper sulfate. Generally, the bath may contain from 25 to 40 ounces of copper per gallon of water.

An amperage as high as 4000 amperes may be employed under these conditions to give a rapid coating procedure. The support for the copper bar is desirably entirely coated with polyvinyl chloride resin in the form of a plastisol or organosol and this coating may vary from ⅛" to ¼" in thickness. If desired, Teflon, which is a fluorinated hydrocarbon resin, may be employed.

With either copper or chromium plating the solution is desirably maintained at a temperature of 120 to 140° F. and desirably it should not exceed 170–180° F.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is a top perspective view of a plating system of the present invention.

FIG. 2 is a transverse sectional view upon the line 2—2 of FIG. 1.

FIG. 3 is a transverse sectional view upon the line 3—3 of FIG. 1.

Referring to FIGS. 1, 2 and 3 there is shown a plating tank A having a movable support B which supports the roller C being plated, said roller being driven by the motor D so as to rotate at an appropriate speed with its lower portion E immersed in the plating bath F.

The tank is provided with sliding members G and H which are coated as indicated at J and K to resist the action of the plating bath F and which carry the bar L held in position by the screws or bolts M.

As previously stated, before the description of the drawings, the support for the copper bar is entirely coated with polyvinyl chloride resin or Teflon.

The tank has the side walls **20**, the bottom **21** and the outstanding side flanges **22**. The end walls **23** also are flanged as indicated at **24** and they have the cutouts **25** to permit rotary drive for the roller C.

At one end of the tank the end wall **23** carries the flanged support **26** above which is positioned a trough **27** to catch any overflow.

The roller C at one of the end walls **23** has a projecting shaft pinion **28** which has a drive roller **29** which rides on the idler roller **30** which are mounted between the plates **31**. The pinion **28** is shown as having elongated teeth to mesh with the rack Z (see FIGS. 2 and 3).

The end of the shaft **28** carries the roller **32** which is driven by a belt **32** from the pulley **34** of the motor D.

The shaft end **50** of the inside end of the roller **30** is mounted to turn in the recess **51** in the cross bar **52** which is supported by the plate **53** and the end angles **54** of the adjustable member B.

The angle members **54** are supported on the flanges **22**

and they may be moved up and down the length of the trough to accommodate different lengths of rollers C.

The electrode connection **55** is to the angle member **56** of the sliding element H which rests on the flange **22**. This member has an inclined portion **57** extending down into the bath F which has a horizontal element **58** carrying the screw or bolts M holding the bar L in position.

The vertical member **59** extends downwardly to the base **21** and it has a foot **60**. The inclined member **57**, the horizontal shoulder **58**, the vertical member **59** and the foot **60** may all receive the insulating coating K which is either of a vinyl polymer or a Teflon resin, also to protect them against the corrosive liquid of the bath.

The other supporting member J which is positioned directly under the roller C has a top shelf or support **65**, the inclined portions **66**, the vertical portions **67** and the lower feet **68**.

This structure is coated by the insulating material J also consisting of a polyvinyl resin or some other synthetic resin or lacquer which will also prevent any corrosion.

The arrangement shown permits ready adjustment of both the bar L, which serves as a copper anode, and the sliding support B for supporting the roller C, and in this manner most effective plating may be achieved.

While there has been herein described a preferred form of the invention, it should be understood that the same may be altered in details and in relative arrangement of parts within the scope of the appended claims.

The circuit is formed at one side through the tank U and through the electrolyte in the tank to the roller T. At the other side it is formed by the switch D, which electrically communicates through the rack Z and the pinion **28** to the plates **98** and **99** to the shaft S and the stub shaft **96** on the end of the roller T. The current will therefore flow from the switch D through the cable or conduit E to the structure above the tank and down through the depending element E by way of the downwardly extending plates **98** and **99** to the roller R and by way of the liquid in the tank to the grounded tank structure.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed:

What is claimed is:

1. In a copper and chromium plating system for plating embossing, engraving and printing rollers with inside and outside end shafts, said system having a longitudinally extending roller with inside and outside end shafts, elongated rectangular cross-section tank having bottom, side and end walls and a top outstanding support flange around the periphery thereof, one of the end walls being provided with a semi-circular cut-out for the outside end shaft of the roller; said system comprising a longitudinally adjustable sliding support for the inside end shaft, a longitudinally adjustable immersed flat narrow metal bar serving as an anode positioned directly below the roller and extending longitudinally of the roller and the tank, and slidable adjustable supports for said bar and insulating

protective coatings encompassing said supports, said tank having a plating bath substantially extending upwardly adjacent to but below the cut-out and the roller being supported so that its lower 10 to 40% will be immersed in the bath, said supports having feet resting on the bottom wall of the tank and one of said supports having an upstanding oblique connection supported on an outstanding flange of the tank, said bar being maintained about midway between the roller being plated and the bottom of the bath and extending to and beyond the edge of said roller.

2. The system of claim **1**, only 20 to 30% of the roller being immersed, said bar being separated from the bottom of the roller by between ½ to 2 times its diameter.

3. The system of claim **1**, said plating solution being at a temperature of 120 to 180° F.

4. The system of claim **1**, the insulating coating being ⅛" to ¼" in thickness.

5. The system of claim **1**, the copper electrode being 1½" in thickness and 5" in width.

6. The system of claim **1**, said sliding support for the inside end shaft consisting of a cross-member extending across the width of the tank below the inside end shaft of the roller and having a vertical bar with a central semicircular recess serving as a bearing for said inside end shaft and the ends of said bar having angle members resting on the support flange at opposite sides of the tank.

7. The system of claim **1**, one of said adjustable supports consisting of an inverted U-shaped member having outstanding flanges at the lower ends thereof extending outwardly from the lower ends of the U-shaped member and the other support member consisting of an inverted L-shaped member having an outwardly extending flange at the lower end thereof and the horizontal portion of the L-shaped member being on the same plane as the bottom of the U-shaped member and having an obliquely and upwardly extending leg to contact and rest upon the support flange at the top of the tank, both said support members being entirely encased in a vinyl polymer resin and the upper end of the oblique leg receiving an electrical connection.

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U.S. Cl. X.R.

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