

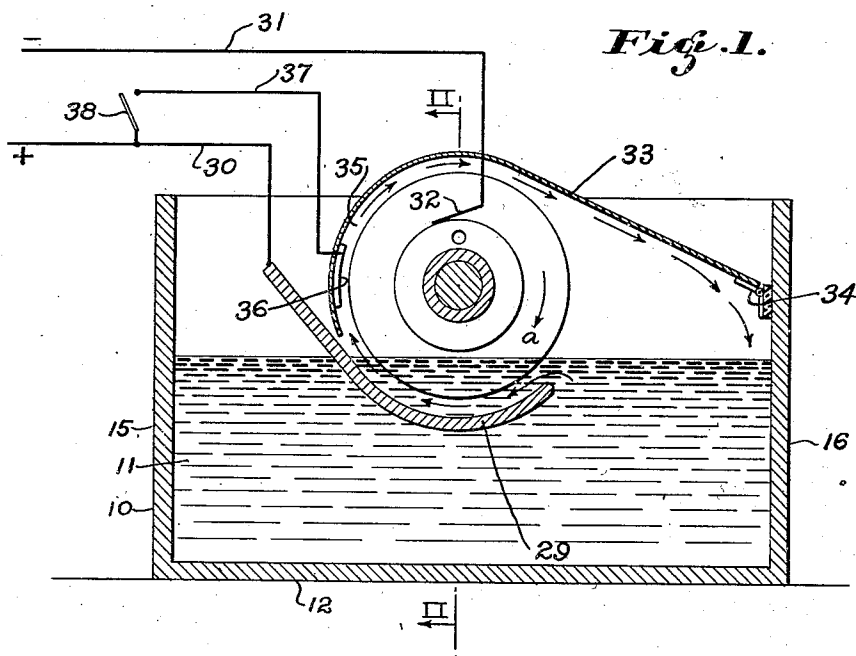
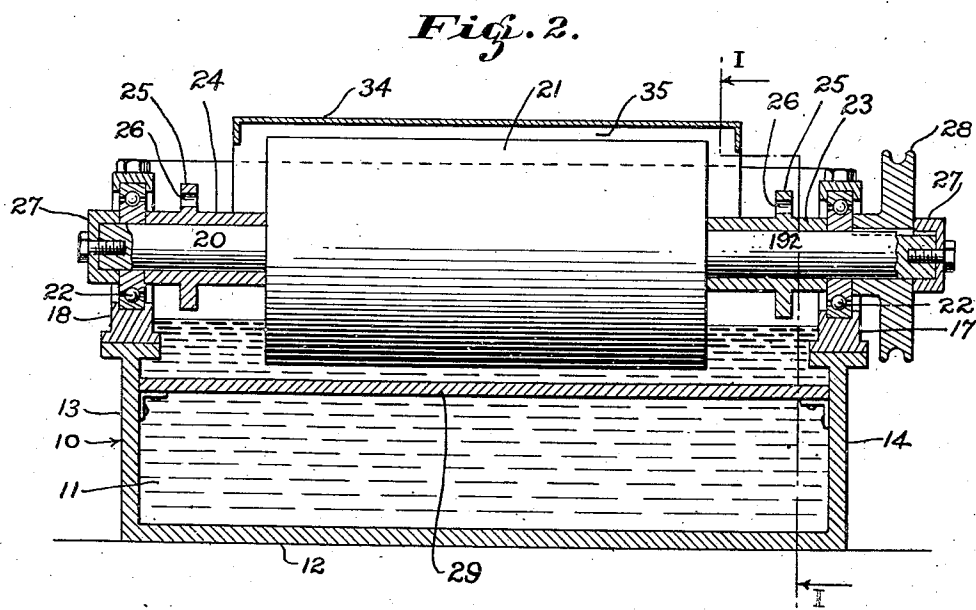
Oct. 25, 1932.

E. S. BALLARD

1,884,512

ELECTROPLATING METALLIC CYLINDERS

Original Filed Dec. 14, 1926



INVENTOR.
Ernest S. Ballard.
BY
Lounsburd, Loftus & Affett
ATTORNEYS.

UNITED STATES PATENT OFFICE

ERNEST S. BALLARD, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO BALLARD PROCESS CO., OF SAN FRANCISCO, CALIFORNIA, A CO-PARTNERSHIP CONSISTING OF RUSSELL B. LEECH, OF SAN FRANCISCO, CALIFORNIA, AND COLVIN M. REED, OF BURLINGAME, CALIFORNIA

ELECTROPLATING METALLIC CYLINDERS

Application filed December 14, 1926, Serial No. 154,671. Renewed January 18, 1932.

This invention relates to a method of electroplating metallic cylinders and an apparatus therefor.

It is the principal object of the present invention to provide means whereby metallic cylinders used in rotary photogravure processes may be rapidly and smoothly surfaced by an electroplating process and in a manner to insure that the plated surface will be smooth and uniform and that the character of the plating will be such as to insure that it will not deteriorate during or after the plating operation.

The present invention contemplates an electroplating vat fitted with a suitable anode member in the vat and other structures by which the cylinder to be plated may be supported for rotation and may be used as a cathode member in conjunction with the anode and electrolyte in a manner to insure that the electroplating operation may be carried out at high speed in applying a uniform coating of metal upon the cylinder.

The present invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a view in transverse section through the device as taken on the line 1—1 of Figure 2.

Figure 2 is a view in longitudinal section through the device as seen on the line 2—2 of Figure 1.

Referring more particularly to the accompanying drawing: 10 indicates an electroplating tank or vat within which a suitable electrolyte solution, 11, is disposed. This solution is maintained at a predetermined level by some suitable means not shown in the drawing. The tank, 10, consists of a bottom 12, opposite ends 13 and 14, and opposite sides 15 and 16. The ends 14 and 15 are fitted with journals, 17 and 18, to receive the trunnions 192 and 20 of a rotogravure cylinder, 21, which cylinder is to be electroplated. The journals 17 and 18 are provided with ball bearings 22 which makes it possible for the cylinder to be rotated at a relatively high speed. The trunnions 192 and 20 of the cylinder 21 are encased in members which are impervious to the action of the electrolyte solution so that

the surfaces of the trunnions will not become pitted during the electroplating operation. These encasing means include sleeves 23 and 24, the sleeve 23 being placed on trunnion 192 and the sleeve 24 being placed on trunnion 20. These sleeves are formed with collars, 25, which serve as commutator members and will be hereinafter described. Openings, 26, are formed through the collars to permit lifting means to be inserted through the openings so that the cylinder may be readily manipulated to place it in the vat and to remove it therefrom. Caps 27 are fastened upon the opposite ends of the trunnion outside of the position of the ball-bearing structure. One of these caps is fitted with suitable means by which the cylinder may be driven, as for example, a pulley, 28. This pulley may be connected with a driving mechanism through a belt. The position of the bearings for the trunnions of the cylinders is such with relation to the level of the electrolyte within the vat that the portion of the cylinder lying below the disc members 25 of the protecting sleeves will be submerged in the electrolyte.

By reference to Figure 1 of the drawing, it will be seen that an arcuate plate, 29, is partially submerged within the electrolyte and disposed beneath the mounted position of the cylinder 21. This plate is of arcuate shape such as to insure that the submerged portion of the plate will conform to the contour of the surface of the cylinder and will be spaced a distance therefrom to provide a passageway or throat of uniform width between the surface of the cylinder and the surface of the plate. A portion of the plate 29 extends above the level of the liquid and is connected with the positive wire, 30, leading from a source of electric supply so that this plate may readily be termed the "anode" plate of the electroplating apparatus. A negative wire, 31, leads from the same source of supply to a contact brush, 32, which bears against the commutator disc, 25, of the sleeves, thus establishing the cylinder, 21 as the cathode member of the electroplating apparatus.

The unsubmerged portion of the cylinder, 21, is temporarily enclosed within or by a shroud, 33, which has an arcuate portion con-

forming to the contour of the cylinder and being spaced therefrom, and continuing in a downwardly deflecting portion secured to the side wall, 16, of the vat. A hinge, 34, may be provided as a mounting for the shroud, 33, so that it may be swung out of the way when the cylinder is to be removed.

By reference to Figure 1 of the drawing, it will be seen that the anode plate 29 and the shroud substantially embrace two-thirds of the circumference of the cylinder at all times, and form an electrolyte passageway, 35, along which electrolyte may be carried as the cylinder 21 is rotated in the direction of the arrow —a— as indicated in Figure 1. In the present instance, it is highly desirable to increase the flow of current through the surface of the cylinder which has previously been submerged in the electrolyte and upon which an electroplating action has taken place. This is done by providing a supplemental anode, 36, within the arcuate portion of the shroud 33 and connecting said anode with a wire, 37, which leads to a switch, 38.

At the present time it is necessary to carry on the electroplating action upon the cylinders at a comparatively slow rate of speed and with a relatively low rate of the current flow. This increases the time required for electroplating and does not obtain the smooth and uniform surface which can be obtained by the rapid process here disclosed.

Attempts have been made to hurry the electroplating action by the use of larger current flow, but this has resulted in producing a spongy and pitted surface not desirable for rotogravure work. By the use of an initial low current and a subsequent high current flow, the method readily lends itself to a rapid electroplating action while producing a firm and uniform surface upon the roll.

In operation of the present invention, the apparatus is assembled as shown in the drawing and a cylinder, 21, to be electroplated is placed within the journal bearings, 17 and 18, after which it may be driven by a suitable means through the pulley 28. The current is then supplied through the wires, 30, 37, and 31 and the cylinder is rotated while its lower portion is submerged in the electrolyte, the speed of rotation being such as to produce a surface speed of approximately 1,000 feet per minute, although it will be understood that other speeds might be adopted if found satisfactory. In any event, it is desirable to produce a sufficiently high speed of rotation of the cylinder to cause it to lift the electrolyte from the surface of the electrolyte in the tank and to draw it along the electrolyte passageway, 35, between the surface of the cylinder and the shroud. This will cause it to be drawn up and thrown over the top of the cylinder and back into the tank as it strikes the deflect-

ing portion of the shroud, 33. By this means electrolyte will be consistently applied to more than fifty percent of the surface of the roll at all times. Initial electroplating will take place while the current is flowing from the anode, 29, to the cathode cylinder, 21. A sustained electroplating action will take place after the surface of the cylinder has passed above the level of the electrolyte solution. This action will be produced between a supplemental anode member, 36, and the cylinder, as the electrolyte is carried along the passageway 35 between the shroud 33 and the cylinder.

It will be found that by this method the agitation of the electrolyte, as produced by the rotating cylinder, and the manner in which the electrolyte is caused to envelope the cylinder in its rotation, insures that a much higher current density may be employed with the resultant decrease in electroplating then required, while placing a given amount of metal upon the cylinder. It is also true that the rotation of the cylinder in the electrolyte and the manner in which it is enveloped by the electrolyte during its high speed of rotation causes the electroplating action to be carried on with fresh and agitated electrolyte at all times, and will also act to insure that the thickness of the electroplating will be uniform and that its texture will be fine and solid, and that its surface will be smooth.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes might be made in the combination, construction and arrangements of parts by those skilled in the art without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is—

1. An apparatus of the class described, comprising a tank within which an electrolyte is adapted to be placed, bearings in the opposite end of the tank for receiving the trunnions of a rotogravure cylinder and supporting it with its lower portion submerged in the electrolyte, means attachable to the trunnions for rotating the same, an anode plate submerged in the electrolyte and conforming to the submerged surface of the cylinder, means for creating a flow of electricity from the anode plate through the electrolyte and to the cylinder, and a shroud enclosing the unsubmerged portion of the cylinder whereby during rotation of the cylinder some of the electrolyte will be confined in close proximity to the cylinder and carried substantially all the way around it.

2. An apparatus of the class described, comprising a vat adapted to contain an electrolyte, bearings in the opposite ends thereof and adapted to receive the end trunnions of a

rotogravure cylinder, casings for the bearings which casings are impervious to the electrolyte, said bearings supporting the cylinder to rotate on its horizontal axis and with its lowermost portion submerged in the electrolyte, an arcuate anode plate submerged in the electrolyte beneath the cylinder and forming an electrolyte passageway of uniform width between the surface of the cylinder and the anode plate, a shroud member enclosing the portion of the cylinder above the surface of the electrolyte and forming a continuing passageway for the electrolyte which is carried up with the cylinder as it rotates, and means for establishing a flow of electric current through the anode plate and the cylinder to produce an electroplating action.

3. An apparatus of the class described, comprising a vat adapted to contain an electrolyte, bearings in the opposite ends thereof and adapted to receive the end trunnions of a rotogravure cylinder, casings for the bearings which casings are impervious to the electrolyte, said bearings supporting the cylinder to rotate on its horizontal axis and with its lowermost portion submerged in the electrolyte, an arcuate anode plate submerged in the electrolyte beneath the cylinder and forming an electrolyte passageway of uniform width between the surface of the cylinder and the anode plate, a shroud member enclosing the portion of the cylinder above the surface of the electrolyte and forming a continuing passageway for the electrolyte which is carried up with the cylinder as it rotates, means for establishing a flow of electric current through the anode plate and the cylinder to produce an electroplating action, and means for rotating the cylinder at a speed of rotation sufficiently high to cause some of the electrolyte to be carried upwardly by the submerged portion of the cylinder and to be carried along the electrolyte passageway between the anode plate, the shroud, and the cylinder, whereby the rotating cylinder will be substantially enveloped in the electrolyte.

4. An apparatus of the class described, comprising a vat adapted to contain an electrolyte, bearings in the opposite ends thereof and adapted to receive the end trunnions of a rotogravure cylinder, casings for the bearings which casings are impervious to the electrolyte, said bearings supporting the cylinder to rotate on its horizontal axis and with its lowermost portion submerged in the electrolyte, an arcuate anode plate submerged in the electrolyte beneath the cylinder and forming an electrolyte passageway of uniform width between the surface of the cylinder and the anode plate, a shroud member enclosing the portion of the cylinder above the surface of the electrolyte and forming a continuing passageway for the electrolyte some of which is carried up with the cylinder as it rotates, means for establishing a flow of electric cur-

rent through the anode plate and the cylinder to produce an electroplating action, means for rotating the cylinder at a speed of rotation sufficiently high to cause the electrolyte to be carried upwardly by the submerged portion of the cylinder and to be carried along the electrolyte passageway between the anode plate, the shroud, and the cylinder, whereby the rotating cylinder will be substantially enveloped in electrolyte, and means for creating a secondary flow of current through the electrolyte enveloping the cylinder above the level of the electrolyte.

ERNEST S. BALLARD.

CERTIFICATE OF CORRECTION.

Patent No. 1,884,512.

October 25, 1932.

ERNEST S. BALLARD.

It is hereby certified that the above numbered patent was erroneously issued to "Ballard Process Co., of San Francisco, California, a co-partnership consisting of Russell B. Leech, of San Francisco, California, and Colvin M. Reed, of Burlingame, California", whereas said patent should have been issued to "Standard Process Corporation, of Chicago, Illinois, a corporation of Delaware", as assignee by mesne assignments of the entire interest in said invention, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of December, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.