M. SCHLÖTTER.

APPARATUS FOR AUTOMATICALLY ELECTROPLATING METALLIC SHEETS BY MEANS OF A REVOLVING CYLINDER.

APPLICATION FILED JAN. 21, 1920.

1,430,855. Patented Oct. 3, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

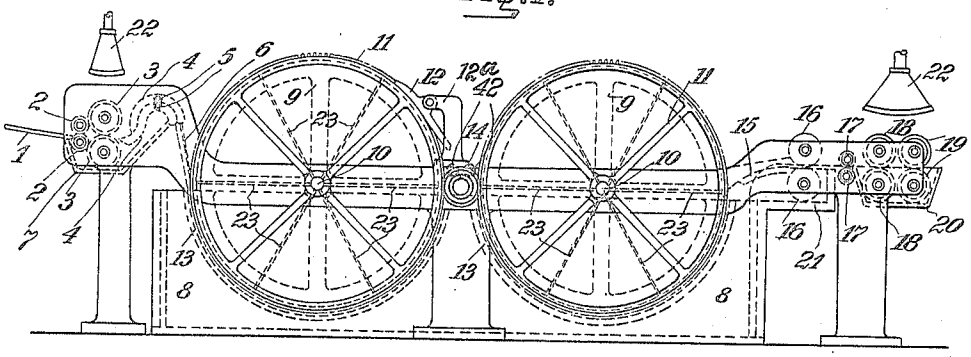


Fig. 2.

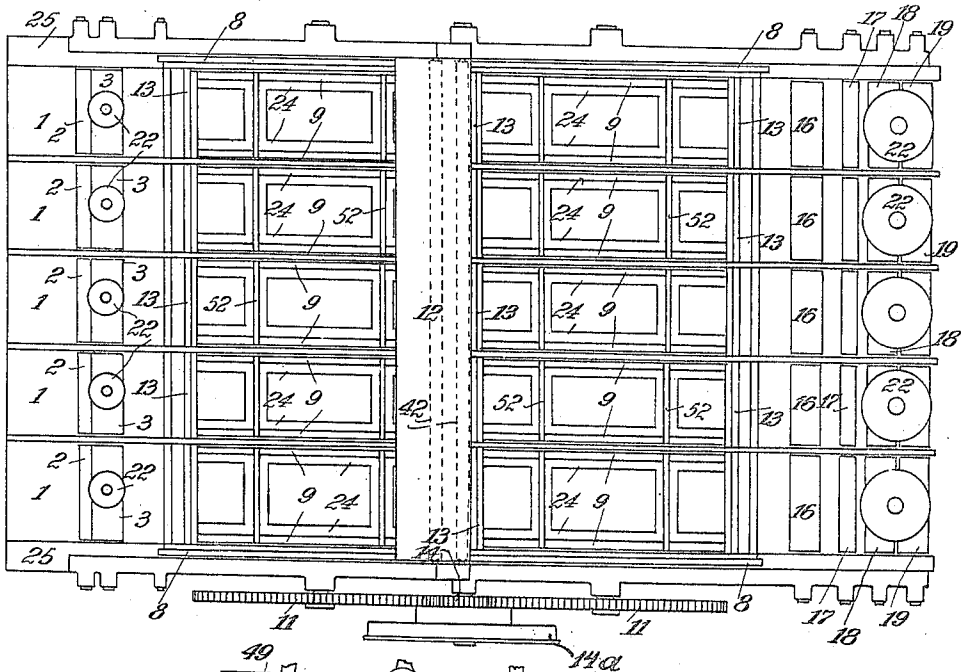
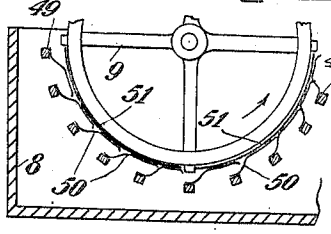


Fig. 10.



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2 SHEETS—SHEET 2.

Fig. 4.

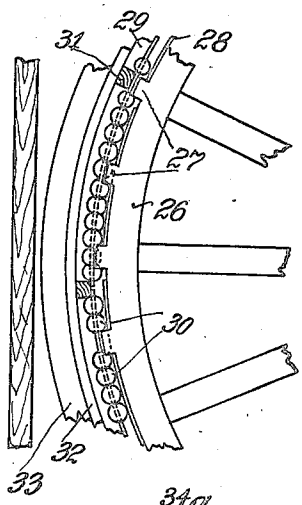


Fig. 3.

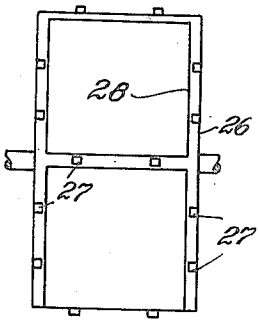


Fig. 5.

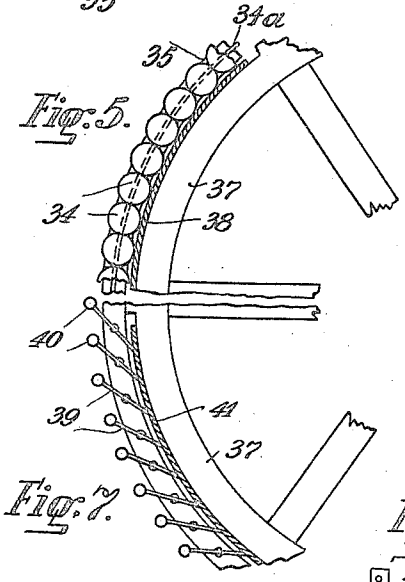


Fig. 7.

Fig. 6.

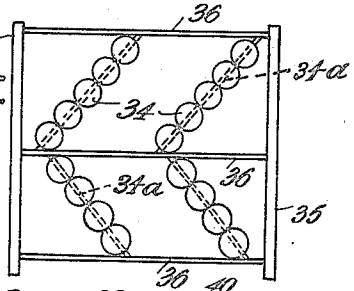


Fig. 8.

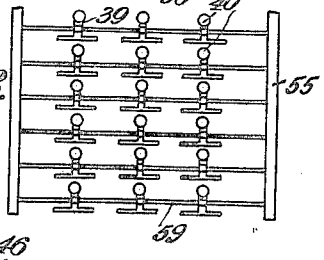
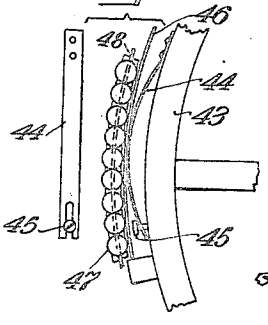


Fig. 9.



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UNITED STATES PATENT OFFICE.

MAX SCHLÖTTER, OF BERLIN, GERMANY.

APPARATUS FOR AUTOMATICALLY ELECTROPLATING METALLIC SHEETS BY MEANS OF A REVOLVING CYLINDER.

Application filed January 21, 1920. Serial No. 353,057.

To all whom it may concern:

Be it known that I, MAX SCHLÖTTER, a citizen of the German Republic, residing at No. 37 Bayreutherstrasse, in the city of Berlin, State of Prussia, Republic of Germany, have invented new and useful Improvements in Apparatus for Automatically Electroplating Metallic Sheets by Means of a Revolving Cylinder, of which the following is a specification.

My present invention relates to an electroplating apparatus and especially to an apparatus for automatically electroplating metallic sheets by means of a revolving cylinder. It is the object of my present invention to provide improvements on apparatus of the last named type.

By my novel improvements I am enabled to obtain a uniform plating over the entire surface of the sheet including those places which heretofore were covered by the clamps for securing the sheets upon the cylinder and therefore could not be plated satisfactorily.

With this object in view I provide the said revolving cylinder with projecting parts between which the sheets to be plated are so placed as to be caused to partake of the revolving movement of the cylinder. In conjunction therewith I provide means for pressing the sheets against the revolving cylinder during the passage of the sheets through the electrolytic bath. I prefer to arrange at least two revolving cylinders in succession. It is a further object of my invention to provide a device for automatically reversing the sheets while passing from one cylinder on to the next one. Other features of my invention will be referred to in the following description.

In the accompanying drawings which form a part of the application, I have illustrated some practical embodiments of my invention, by way of example.

In Fig. 1 I have shown in side elevation an electroplating apparatus according to my present invention and comprising two revolving cylinders disposed in succession.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a view of a part of a cylinder with sheet holding projections of a modified construction.

Fig. 4 is a side view of a part of a cylinder and illustrating one construction of the means for holding the sheets in position during the passage of the latter through the bath.

Figs. 5 and 6, showing in a vertical section and in a side view respectively, pressing means in a modified arrangement.

Figs. 7 and 8 showing, in views corresponding to Figs. 5 and 6, pressing means of a modified character.

Fig. 9 shows in two detail views pressing means of a combined character, and

Fig. 10 is a section through a portion of an electroplating apparatus and showing pressing means of a simple construction.

Relating to the electroplating apparatus as shown in Figs. 1 and 2, it will be seen that each cylinder is constructed of two wheel-like structures 9 interconnected by means of cross stays 52. The structures 9 are provided with recesses 24 which are continued along both sides of each cross stay 52 so as to form frame-like structures adapted to receive the sheets to be plated. By means of the number of cross stays 52 each cylinder may be provided with any desired number of such sheet holding frames. The cylinders are mounted to revolve within a container 8 for the liquid electrolyte. In the embodiment of my invention shown in Figs. 1 and 2 five such cylinders are mounted on a common shaft 10 and two groups of five cylinders each are arranged in succession. The container 8 is provided with semi-annular anodes 13, one for each cylinder and disposed so as to surround the lower portion of the same. In front of the apparatus there is provided a table 1 upon which the sheets to be electroplated are placed by hand or mechanical means. At the rear side of each table, there are mounted a pair of feeding rolls 2, 2 and a pair of revolving brushes 3, 3. There is further provided a guide 4 leading through a pair of feeding rolls 5 on to a sliding surface 6 which terminates in front of the first cylinder. Above the pair of rotating brushes 3, 3 is disposed a watering device 22, the water being collected in a trough 7 and continually discharged therefrom by any convenient means of well known construction.

At one end of each shaft 10 I have provided a toothed wheel 11. Both of said wheels 11 receive their revolving movement from an intermediate wheel 14 which is actuated from a convenient source of motive power by means of a pulley 14^a (Fig. 2).

All of the shafts which extend over the entire width of the container 8, are mounted in bearings of two frame-like structures 25, 25 (see Figs. 1 and 2).

The frame-like recesses 24 are provided with contact strips which I have not shown in the drawings and which receive the electric current by means of the conductors 23 and the shafts 10 to which the conductors 23 are fixedly connected. The shafts 10 are adapted to be connected to a source of electric current by any of the means well known in the art and which I have not especially illustrated.

To prevent the sheets placed within the frame-like recesses 24 of the cylinder from falling out of place I have provided cross bars 49 within the container 8, which cross bars are positioned so as to surround the lower half of the cylinders, as is shown in Fig. 10. These cross bars carry springs 50 of the shape illustrated in Fig. 10 and adapted to press the lateral edges of the sheets against the frames 24. These springs are made of an insulating material.

Between two succeeding groups of cylinders I have provided a reversing device of the following construction.

At the rear and tangentially to the upper half of the first cylinder I have arranged a plate 12 which is adjustably suspended from a pair of posts 12^a. This plate is positioned so as to act as a stop for the sheets while the same are being carried out of the bath and leave the control of the pressing springs 50. Owing to its tangential position the plate 12 tends to bend the upper edge of the sheet again in contact with the cylinder, thereby causing the lower edge to move away from the cylinder as soon as this edge is no longer under the influence of the last pressing spring 50 (see Fig. 10). The sheet, then for a moment assumes the position of the reversing plate 12 and thereafter, in consequence of its unsupported weight, falls between a pair of revolving rolls 42 (see Figures 1 and 2) which feed the sheet on to the next cylinder. It will be seen that the sheet surface which faced the first cylinder, forms now the outer surface, while the sheet surface which on the first cylinder was on the outside is now facing the second cylinder.

Owing to the function of the reversing device 12 it is possible to give the sheets on one surface a plating of one metal and on the other surface a plating of a different metal. For that purpose, however, the bath container 8 must be provided with a separation wall in such a manner that each cylinder may revolve within its special electrolyte. Each electrolyte is to be selected in accordance with the plating desired.

If I dispense with the sheet reversing plate 12 and provide instead a guide to transfer the sheets from one cylinder to the next one without reversing the same, I may double the working speed of the cylinders, or, if retaining the same speed, I obtain a correspondingly thicker plating. If provision is made for having each cylinder revolve in its special electrolyte I am able to provide one and the same surface of the sheet with two or a plurality of platings of different metallic character.

In Fig. 3 I have shown a cylinder on which the frame-like recesses for the reception of the sheets to be plated are formed by radially projecting pins or bosses 27 between which the sheets 28 are being placed during the revolving movement of the cylinder. These bosses 27 act as stops causing the sheets to partake of the revolving movement as long as the same are being pressed in contact with the surface of the cylinder. This construction of the cylinder is advantageous in so far as the sheets may be of varying size and contour. As pressing means I may employ the springs 50 illustrated in Fig. 10 and mounted on cross bars 49 of the container 8.

Another construction of the pressing means I have shown in Fig. 4, illustrating in a vertical section a part of an electroplating apparatus on an enlarged scale. The revolving cylinder 26 is provided with projecting bosses 27 between which the sheets 28 are placed and kept in position by means of balls 30 consisting of an insulating material and being mounted within a pair of frames 29 interconnected by cross stays 31. The curved anode is designated 32 and mounted on a frame 33. The pressing members 30 may also be of a cylindrical shape.

In Figs. 5 and 6 I have shown, in a sectional and side view respectively, modified means for keeping the balls 34 in working position. In this case the balls 34 are mounted upon wires 34^a which are carried by a frame consisting of the lateral bars 35 and the cross bars 36. As is shown in Fig. 6 I prefer to give the wires 34^a an oblique position with regard to the frame bars 35 and 36 which are positioned within the bath container 8 and so as to surround the cylinder 27 along a semi-circle. In Fig. 5 I have indicated the sheet 38 in the position in which it is being pressed upon the cylinder 37 by means of the balls 34.

In Figs. 7 and 8 I have shown, in a vertical section and in a side view respectively, modified pressing means consisting in this case of pivotally mounted double armed levers 39 provided with weights 40 at the end of the free arm while the inner lever arm acts upon the sheet 41 and presses the same against the revolving cylinder 37. The double armed levers 39 are mounted upon cross rails 59 which are carried on curved side bars 55.

In Fig. 9 I have shown a combination of springs and pressing balls in two detail views. The contact springs 44 are secured with one end upon the surface of the cylinder 43 while the other end is provided with a slot through which extends a screw 46. The balls 47 are mounted upon wires 48 and press the sheet 46 against the contact springs 44 whereby a reliable contact is obtained between the sheet to be plated and the electric current carrying contact strips 44.

The mode of operation is as follows.

The sheets to be plated are placed, by hand or mechanical means, upon the table 1 (see Figs. 1 and 2) and moved forward until engaged by the feeding rolls 2, 2 which carry the sheet through the revolving brushes 3, 3 and thereafter into the guide wherein another pair of feeding rolls 5, 5 take hold of the sheet and cause the same to pass on to the sliding surface 6. At the end of the latter the sheet is engaged by the first revolving cylinder and carried thereon through the electrolyte contained within the container 8. At the end of a half revolution of the first cylinder the sheet becomes released and is reversed by means of the reversing plate 12 in the manner described above. After the reversing action the rollers 42 take charge of the sheet and forward the same on to the second cylinder which at once moves the sheet through the electrolyte. At the completion of a half revolution of the second cylinder the sheet leaving the bath passes through the guide 15 and between a pair of pressing rollers 16, 16 which remove from the sheet any adhering electrolyte which drops into the receiver 21 and flows back into the container 8. On leaving the pressing rollers 16, 16 the sheet is engaged by a pair of feeding rolls 17, 17 and passes on between two pairs of revolving brushes 18, 18 and 19, 19 which are mounted within a container 20 in which the water provided by means of the watering device 22 is being collected and discharged by well known means.

While I have shown some specific means by which my invention may be carried into effect I am aware that modifications may still be made in connection with some constructional parts which modifications, however, do not modify the spirit of my invention.

What I claim as my invention and desire to secure by Letters Patent of the United States, is:—

1. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by said cylinder for receiving the article to be plated, means carried by the container for engaging the article to be plated and retaining the same on the cylinder during its passage through the container, and means for electrically connecting the cylinder with a source of current.

2. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, spaced members carried by said cylinder for receiving the article to be plated, means carried by said container for engaging the article to be plated and retaining the same between said spaced members during its passage through the container, and means for electrically connecting the cylinder with a source of current.

3. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, frame members spaced apart on said cylinder for receiving the article to be plated, means carried by said container for engaging the article to be plated and retaining it between said frame members during its passage through the container, and means for electrically connecting the cylinder with a source of current.

4. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by the cylinder for receiving the article to be plated, insulated members carried by said container for engaging the article to be plated and retaining the same on the cylinder during its passage through the container, and means for electrically connecting the cylinder with a source of current.

5. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by the cylinder for receiving the article to be plated, flexible insulated members carried by said container for engaging the article to be plated and retaining the same on the cylinder during its passage through the container, and means for electrically connecting the cylinder with a source of current.

6. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by the cylinder for receiving the article to be plated, means carried by said container for engag-

ing the article to be plated and retaining the same on the cylinder during its passage through the container, means for electrically connecting the cylinder with a source of current, and resilient connecting strips in electrical contact with said cylinder and adapted to engage the article to be plated.

7. An electroplating apparatus, comprising in combination, an electrolyte container, a revoluble cylinder having its lower portion with said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by the cylinder for receiving the article to be plated, flexible insulated members carried by said container for engaging the article to be plated and retaining the same on the cylinder during its passage through the container, means for electrically connecting the cylinder with a source of current, and resilient connecting strips in electrical contact with said cylinder and adapted to engage the article to be plated.

8. An electroplating apparatus, comprising, in combination, an electrolyte container, a plurality of revoluble cylinders arranged in succession and each having its lower portion within said container, an anode in the container concentrically disposed relatively to each of said cylinders, means carried by each of the cylinders for receiving articles to be plated, means carried by the container for engaging the articles to be plated and retaining the same on said cylinders during their passage through the container, means between said cylinders for reversing the articles during their passage from one cylinder to another, and means for electrically connecting the cylinders with a source of current.

9. An electroplating apparatus, comprising, in combination, an electrolyte container, a plurality of revoluble cylinders arranged in succession and each having its lower portion within said container, an anode in the container concentrically disposed relatively to each of said cylinders, means carried by the cylinders for receiving articles to be plated, means carried by the container for engaging said articles and retaining them on the cylinders during their passage through the container, a plate disposed tangentially to the surface of one cylinder and adapted to engage the articles so as to reverse the same during their passage from one cylinder to another, and means for electrically connecting the cylinders with a source of current.

10. An electroplating apparatus, comprising, in combination, an electrolyte container, a plurality of revoluble cylinders having their lower portions within said container, an anode in the container concentrically disposed relatively to each of said cylinders, means carried by the cylinders for receiving articles to be plated, a plurality of springs carried by said container for engaging said articles and retaining them on the cylinders during their passage through the container, and means for electrically connecting the cylinders with a source of current.

11. An electroplating apparatus, comprising, in combination, an electrolyte container, a plurality of revoluble cylinders having their lower portions within said container, an anode in the container concentrically disposed relatively to each of said cylinders, means carried by said cylinders for receiving articles to be plated, means carried by the container for engaging said articles and retaining them on the cylinders during their passage through the container, means for electrically connecting the cylinder with a source of current, and resilient connecting strips in electrical contact with each of the cylinders and adapted to engage the articles carried thereby.

12. An electroplating apparatus, comprising, in combination, an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by said container for engaging said articles and retaining them on the cylinder during their passage through the container, means for electrically connecting the cylinder with a source of current, means for feeding the articles on to said cylinder, and means for discharging the plated articles after their passage through the container.

13. An electroplating apparatus, comprising, in combination, an electrolyte container, a plurality of revoluble cylinders each having its lower portion within said container, an anode in the container concentrically disposed relatively to each of said cylinders, means carried by the cylinders for receiving articles to be plated, means carried by the container for engaging said articles and retaining them on the cylinders during their passage through the container, means between said cylinders for reversing the articles during their passage from one cylinder to the other, means for feeding the articles on to one of said cylinders, means for discharging the plated articles from another of said cylinders, and means for electrically connecting the cylinders with a source of current.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses,

MAX SCHLÖTTER.

Witnesses:
EMIL HOFFMANN,
PAUL NAUN.