July 31, 1951 M. S. SCHNEIDER 2,562,683

ARTICLE-SUPPORT FOR ELECTROPLATING RACKS

Filed June 8, 1949 2 Sheets-Sheet 1

Fig. 1.

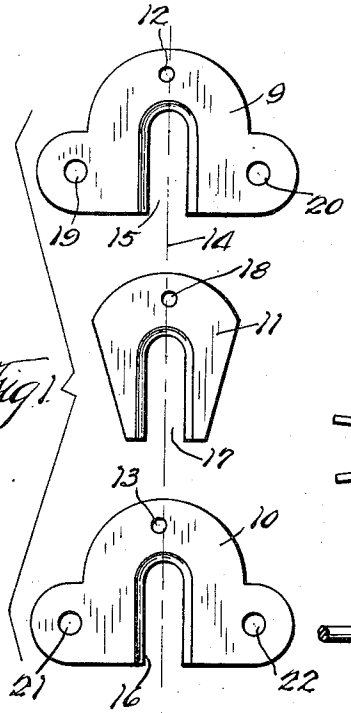


Fig. 2.

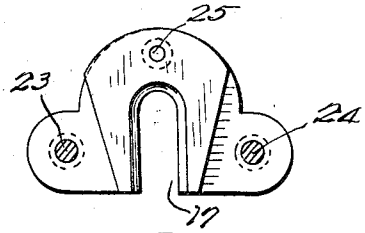


Fig. 3.

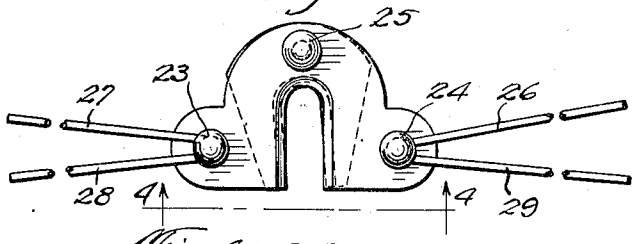


Fig. 4.

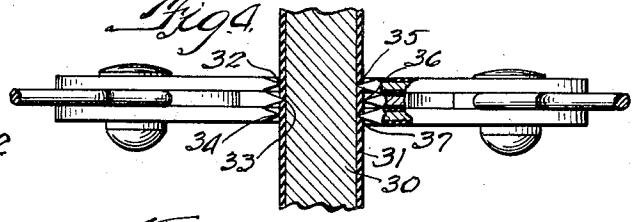


Fig. 5.

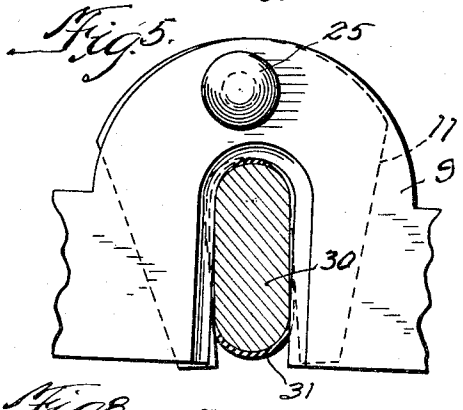


Fig. 6.

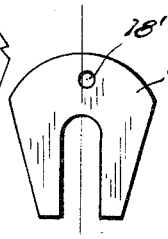


Fig. 8.

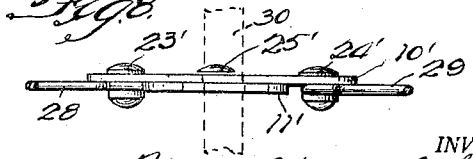
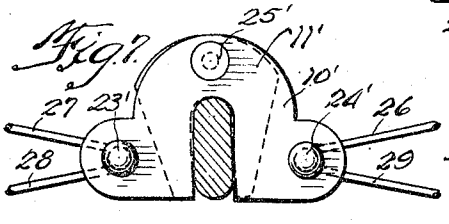


Fig. 7.



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ARTICLE-SUPPORT FOR ELECTROPLATING RACKS

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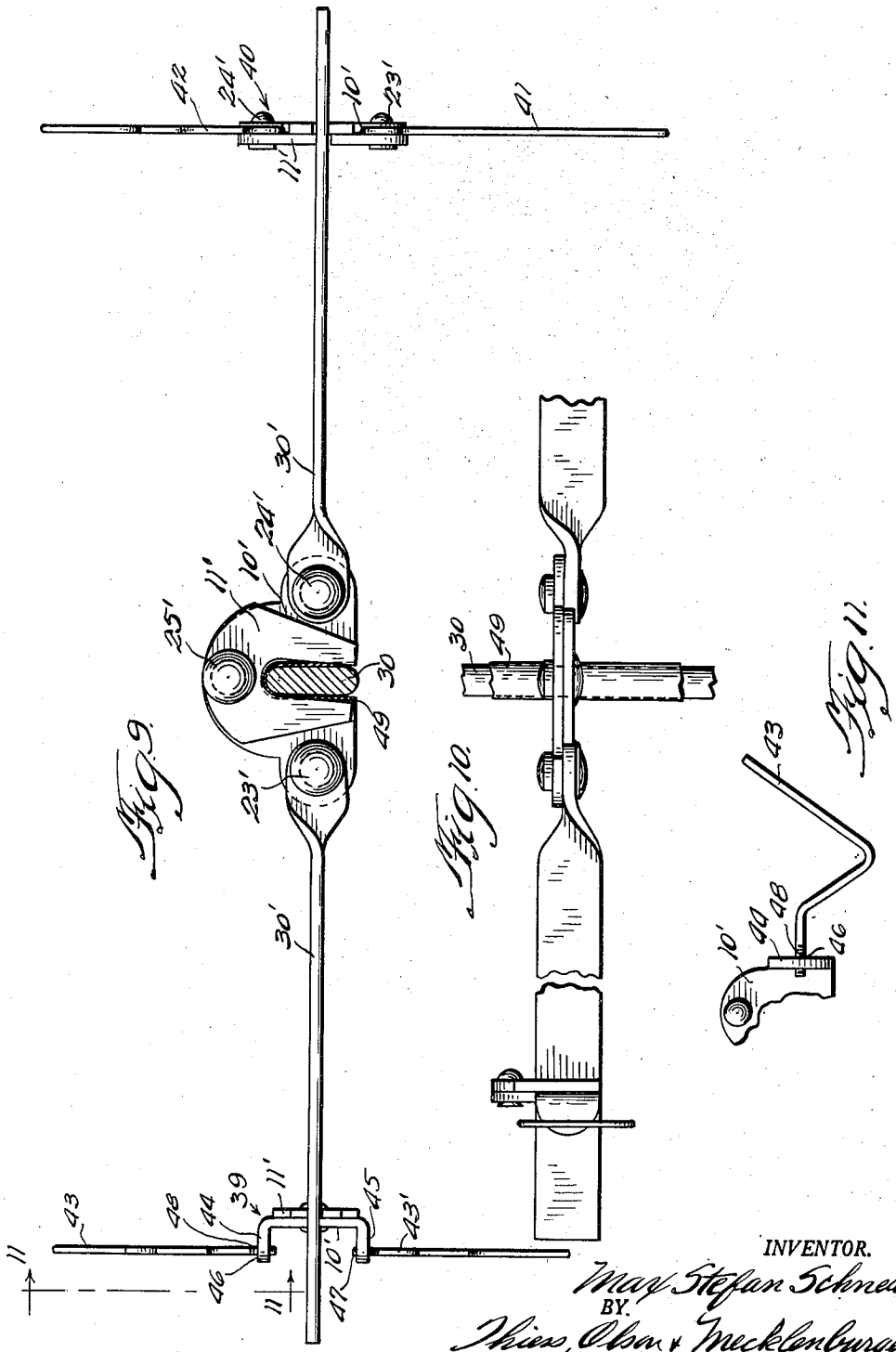


Fig. 9.

Fig. 10.

Fig. 11.

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ARTICLE SUPPORT FOR ELECTROPLATING RACKS

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8 Claims. (Cl. 204—297)

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The present invention relates to improvements in electroplating apparatus, particularly that part which concerns itself with the means for supporting the articles that are to be plated.

In the art of electroplating, current-conducting supports are usually suspended from bus bars so that they will dip into the electroplating bath, the supports being provided with laterally extending sub-supports, also made of conducting material, from which the parts that are to be electroplated are suspended in the electrolyte. In order to avoid plating the supports, these are usually covered by means of an insulating material, such as some form of natural or synthetic rubber or other plastic that is not adversely affected by the electrolyte.

In accordance with the prior art proposals, such so-called "racks" were usually made up to specifications, consisting of an elongated vertical current-conducting member to which were suitably secured the laterally extending individual supports for the articles to be plated. All but the extreme ends of these laterally extending supports were then covered with rubber or similar material. Quite evidently it would be quite impossible to modify such a rack, and therefore the plater had to keep in stock a large number of different types of racks, each adapted for the support of certain kinds of articles.

While some proposals have been made, primarily by the present applicant, for the provision of insulation-covered racks which had detachable and movable work-supporting members, which were attached to the longitudinal vertically extending insulation-covered current conductor by means of screws provided with sharp points that would readily penetrate the insulation so as to establish electrical contact with the current conductor, such detachable and movable clamps required numerous separate parts, threaded openings, therewith interfitting screwed members, and, in general had to be made quite of complicated construction so that they were relatively expensive. An example of such a construction is shown and claimed in applicant's copending application, Serial No. 593,441, now Patent Number 2,512,554, in which the individual supports are provided with U-shaped clamps through at least one of the legs of which extends a screw having a sharp point capable of penetrating the insulation of the vertically extending current conductor. These clamps are also covered with insulation to prevent their becoming plated during use and only the ends thereof are free of insulation at the points

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where they support the articles that are to be plated.

It is one of the objects of the present invention to provide article supports adapted particularly for use with insulation-covered conductors, so formed that they may be merely pushed or driven onto said conductors at any desired point, being provided with means for cutting through the insulation, if necessary.

It is a further object of the invention to provide article supports that may be readily attached and detached from current conductors without the use of any special tools and may be shifted about on the conductor as may be necessary to accommodate articles of varying shapes and sizes.

It is a further object of the invention to provide article supports and shims cooperating therewith so as to render them attachable to current conductors of different thicknesses.

Further objects of the invention will become apparent from the more complete description of the present invention when considered in connection with the annexed drawing in which

Fig. 1 is a collective elevational view of three components of one of the article supports;

Fig. 2 is an elevational view, partly in section, showing two of the parts in assembled relationship;

Fig. 3 is an elevational view of a completed support;

Fig. 4 is a bottom view, partly in section, along the line 4—4 of the support shown in Fig. 3;

Fig. 5 is an elevational view, on a somewhat enlarged scale, of a portion of the support, some portions being shown in section;

Fig. 6 is a view, similar to that of Fig. 1, showing a two-component support;

Fig. 7 is an elevational view of the support separately shown in Fig. 6;

Fig. 8 is a bottom plan view of the support shown in Fig. 7;

Fig. 9 is a plan view of a support attached to a current conductor, and, while itself serving as such a conductor, also carries secondary supports which are attached in the same manner as is the main support, also carrying smaller hooks, etc., for individual objects to be plated;

Fig. 10 is an elevational view of a portion of the support shown in Fig. 9, illustrating the use of shims to compensate for the lack of thickness of the main current conductor; and

Fig. 11 is a side elevational view of a part of the structure shown in Fig. 9 as indicated by the arrows and numerals 11.

The general principle upon which the supports of the present invention are based is as follows:

When two mutually attached parts having an open slot are so connected that the slots are substantially superimposed, both opening in the same direction but with the slots very slightly out of alignment with each other, and an attempt is made to slip the parts with their slots over a suitably shaped and dimensioned supporting rod or the like, the diameter of which corresponds to the width of the slots, it will be found that, by reason of the off-set or out-of-register relationship of the slots, the parts will bind; this being especially true if the parts are so connected with each other that they are capable of relative movement. As the part which the slots subtend begins to be thrust further into the slots it will tend to push the other part slightly to one side, so that a binding effect or wedging action takes place, so that the parts will be rather securely attached to the supporting rod. The connection is, however, still capable of release by pushing the parts from the supporting rod. Hence it becomes possible to secure such article supports to an elongated rod or other support at any desired place, so as to build up a plating rack of the desired number of supports and configuration.

The article-supporting parts may consist of two or more members, arranged substantially as follows: Thus there may be two parts, such as the outer parts **9** and **10**, shown in Fig. 1, and an intermediate part **11**. The parts **9** and **10**, which may be of the same shape and thickness, are provided with rivet holes **12** and **13**, which are displaced slightly from a center line **14** which defines the center of slots **15**, **16** and **17** formed in the members **9**, **10** and **11**. The member **11** is provide with a similar rivet hole **18** which is likewise displaced relative to the center line **14**, but on the opposite side thereof. Congruent and accurately aligned further rivet holes **19**, **20**, **21** and **22** are also provided for the purpose of securing the outer members **9** and **10** to each other. The parts are assembled by putting rivets (or screws) **23**, **24** and **25** through the holes **12**, **13**, **18**, **19**, **20**, **21** and **22**, the rivets passing through the holes **12**, **13** and **18** being loose enough to permit slight movement between the members **11** and the other two members **9** and **10**, which latter are rigidly connected by virtue of the presence of the rivets **23** and **24**.

Electrically conducting arms **26**, **27** **28** and **29** are secured to the part **10** by being crimped under the heads of the rivets (or screws) **23** and **24**, and these arms extend laterally from the assembled article supports, all as illustrated in Fig. 3. As can be seen from the latter figure, the openings of the slots are slightly out of register with each other, the two outer ones being in accurate alignment, but the center one (**17**) being awry.

When, therefore, a structure such as that thus far described is forcibly pushed onto a metallic electrically conducting strip **30**, as shown in Fig. 4, the article support will be tightly wedged thereonto by reason of the eccentric or out-of-register arrangement of the three parts. If such a member as the conductor **30** be covered with an electrically insulating layer **31**, for example rubber, artificial rubber, polyethylene plastic, etc., it is possible for the metallic members to cut through the same by making the edges that define the side of the slot sharply beveled to provide knife edges **32—37**, some of which will cut through the insulation layer **31** as shown. Thus

knife edges **33**, **35** and **37** will have cut through, while, in the view shown in Fig. 4, knife edges **32**, **34** and **36** have not. However, as not visible in the figure, the portions of the members **9**, **10** and **11** further back in the slot will have cut at corresponding portions further back, by reason of the lack of registry of the various parts. In other words, the parts make four contacts with the conductor **30**, two in the forward portions of the slot and two further back. Inasmuch as all the parts are, however, riveted or screwed together, there will be ample contact for the flow of electrical current from the conductor **30** to all parts of the article support, including the arms **26**, **27**, **28** and **29**.

A somewhat simpler construction is illustrated in Fig. 6 and Fig. 7, using only two parts **10'** and **11'**, these being connected through the two eccentric or out-of-alignment rivet holes **12'** and **18'**. Rivets **23'** and **24'** in this case serve merely to connect the arms **26**, **27**, **28** and **29** to the member **10'**. A rivet **25'** serves to connect parts **10'** and **11'**. The assembly is shown as a bottom view in Fig. 8.

A further modification within the general scope of the present invention is illustrated by Figs. 9 and 10 in which the connecting means, consisting of the assembled elements **10'** and **11'**, secured to each other by the rivet **25'** (all similar to the construction described in connection with Figs. 7 and 8), is used to support laterally extending secondary conductors **30'** which are riveted to the parts **10'** by rivets **23'** and **24'**. Further article-supporting connector members **39** and **40** are secured to the lateral supports **30'** in exactly the same manner as described in connection with parts **10'** and **11'**, although, by reason of the smaller size of the supports **30'** the individual parts of the article-supporting members **39** and **40** are correspondingly reduced in size, so that the same type of sliding and clamping connection can be availed of. Supporting member **40** carries arms **41** and **42**, arm **42** being elaborated into a hook which has the same shape as the hooks **43** and **43'** shown in Fig. 11. In the case of the connector **40**, the arms **41** and **42** are connected by rivets **23'** and **24'** in the same manner as shown in Figs. 7 and 8.

A still further feature of the modification of the present invention is illustrated in connection with Figs. 9, 10 and 11, and comprising arranging the parts of the connector **39** in such a way that the extensions of the part **10'**, instead of being perforated and carrying connecting rivets, has its ends bent over at a right angle to provide ears **44** and **45**. Both of these ears are provided with threaded openings **46** and **47** into which the correspondingly threaded ends **48** of the hooks **43** and **43'** are screwed. By providing a plurality of such threaded hooks **43**, any such hooks as may have become corroded or defective can readily be replaced, which would not be true if they were riveted as are the hooks **42** shown in connection with connector **40** shown at the right side of Fig. 9. By reason of this screwed manner of attachment, the angular position of the hooks **43** and **43'** can be varied as desired.

A still further development of the fundamental idea of the present invention is illustrated by Figs. 9 and 10. Thus if the main current conductor **30** has been either corroded or deliberately ground down so as to be of a lesser than its normal thickness, which would make the connectors fit too loosely on it to remain properly in place, a shim **49** is used that encloses three sides of the

conductor 30 so as to make the connectors to take a sufficient bite to secure them tightly in place. Of course such a shim must be made of a current-conducting material. Copper sheeting or foil serves this purpose. It will be obvious that this particular modification is inapplicable to conductors that have previously been covered with an insulating material.

While not absolutely essential, it is advisable to cover the assembled article supports with an insulating layer after they have been riveted or screwed together, leaving only the extreme ends of the arms 26—29 uncovered, so that they may serve to conduct electrical current to the article supported thereby during the plating operation.

The manner of use of the article supports of the present invention is as follows:

As many of the supports as may be desired are applied to the generally vertically supported conductor 30 by pushing them onto the conductor at selected intervals, pushing them on with sufficient force to cut through the insulating layer 31. This therefore produces a plating rack of the desired size and configuration. The articles to be plated are then hung or otherwise secured from or to the arms 26—29, and the plating rack then hung into the plating tank from a suitably provided bus bar, which, as is usual, runs along the top of the plating tank. As such arrangements are very well known, it is not deemed necessary specifically to illustrate them.

The members of the article-supporting rack may be made of any suitable electrically conducting substance, such as metal, carbon or graphite, although for most purposes metal, such as brass, bronze, steel, iron, zinc, copper, etc., are to be preferred, depending upon the type of operation, i. e. whether it is one of plating, pickling, anodic oxidation, rustproofing, etc.

No particular sizes are specified as these depend entirely upon circumstances, provided only that the opening of the slots is about the same as that of the rod or other conductor to which the article-supporting members are to be secured. As a mere guide to construction, it may be stated that all the figures, with the exception of Figs. 4 and 5, are substantially full size of an actual embodiment of the present invention. While the slots have been shown U-shaped, it is obvious that they could have square or other shaped closed ends, but the U-shaped arrangement is satisfactory and more pleasing in appearance, and, if anything, somewhat stronger, and hence is preferred.

Obvious modifications in the manner of securing the parts together, not omitting welding or brazing, are to be considered as within the scope of the present invention, but generally, the arrangement in which at least one of the eccentrically mounted parts may move relative to the other or others is the preferred construction.

Applicant claims:

1. An article support adapted for quick attachment to the current-carrying metallic member of an electroplating rack comprising clamping members pivotally secured to each other and having substantially superimposed but slightly diverging U-shaped slots therein, the open ends of said slots being substantially equidistant from the pivot point and the pivot being displaced from the extended center line of at least one of the U-shaped slots, whereby when said members are forced onto a current carrier having a diameter corresponding to the width of the slots,

the members will be wedged against the sides of said current-carrying member making a number of points of contact therewith.

2. An article support adapted for quick attachment to the current-carrying metallic member of an electroplating rack comprising clamping members having identical U-shaped openings, and pivotally secured to each other with said openings substantailly superimposed, but slightly diverging, the open ends of the U-shaped slots being substantially equidistant from the pivot point and the pivot being displaced from the extended center line of at least one of the U-shaped slots.

3. An article support adapted for quick attachment to the current-carrying metallic members of an electroplating rack comprising sheet-like face-to-face clamping members pivotally secured to each other and having substantially superimposed but slightly diverging U-shaped slots therein, said slots having their open ends substantially equidistant from the pivot and the pivot being displaced from the extended center line of at least one of the U-shaped slots, whereby when said members are forced onto a current carrier having a diameter corresponding to the width of the slots, the members will be wedged against the sides of said current-carrying member making a number of points of contact therewith, at least one of the inner edges defining one of said slots being bevelled to a cutting edge.

4. An article support adapted for quick attachment to the current-carrying metallic member of an elecroplating rack comprising clamping members pivotally secured to each other and having substantially superimposed but slightly diverging U-shaped slots therein with their open ends substantially together and the pivot being slightly offset relative to the extended center line of at least one of said slots, whereby when said members are forced onto a current carrier having a thickness corresponding to the width of the slots, the members will be wedged against the sides of said current-carrying member making a number of points of contact therewith, the inner edges defining at least one of said slots being bevelled to cutting edges.

5. An article support adapted for quick attachment to the current-carrying metallic member of an electroplating rack comprising at least two superimposed clamping members provided with identical U-shaped openings of a width corresponding to the smaller diameter of a flat-oval current-carrying member and with said openings superimposed but slightly diverging and their open ends in the same direction, said members being pivotally secured to each other at a point above the semi-circular portion of the U but displaced from the extended center line of at least one of the U-shaped openings, thereby providing for movement of the clamping members relative to each other.

6. An article support adapted for quick attachment to the current-carrying metallic member of an electroplating rack comprising a plurality of superimposed clamping members each provided with a U-shaped-slot of the same width as that of an adjacent clamping member, said slots being superimposed but slightly diverging and opening in the same direction, said clamping members being pivotally secured to each other by a pivot passing through openings adjacent the closed ends of the slots and which are to one side of the extended center line of said slots, so

that said slots will be slightly offset relative to each other.

7. The article support as claimed in claim 6 in which the clamping members are provided with current-conducting supports extending laterally therefrom.

8. An electroplating rack comprising the combination of a longitudinally extending, insulation-covered current conductor and a plurality of article-supporting members clamped thereto, said members comprising slotted metallic elements provided with U-shaped slots and pivotally secured to each other so that said slots are superimposed but slightly diverging and their open ends in the same direction but slightly offset relative to the extended center line of at least one of the slots, some of the portions of said members defining said slots being provided with insulation-cutting beveled edges that cut through the insulation and establish current-conducting contact with said conductor.

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