

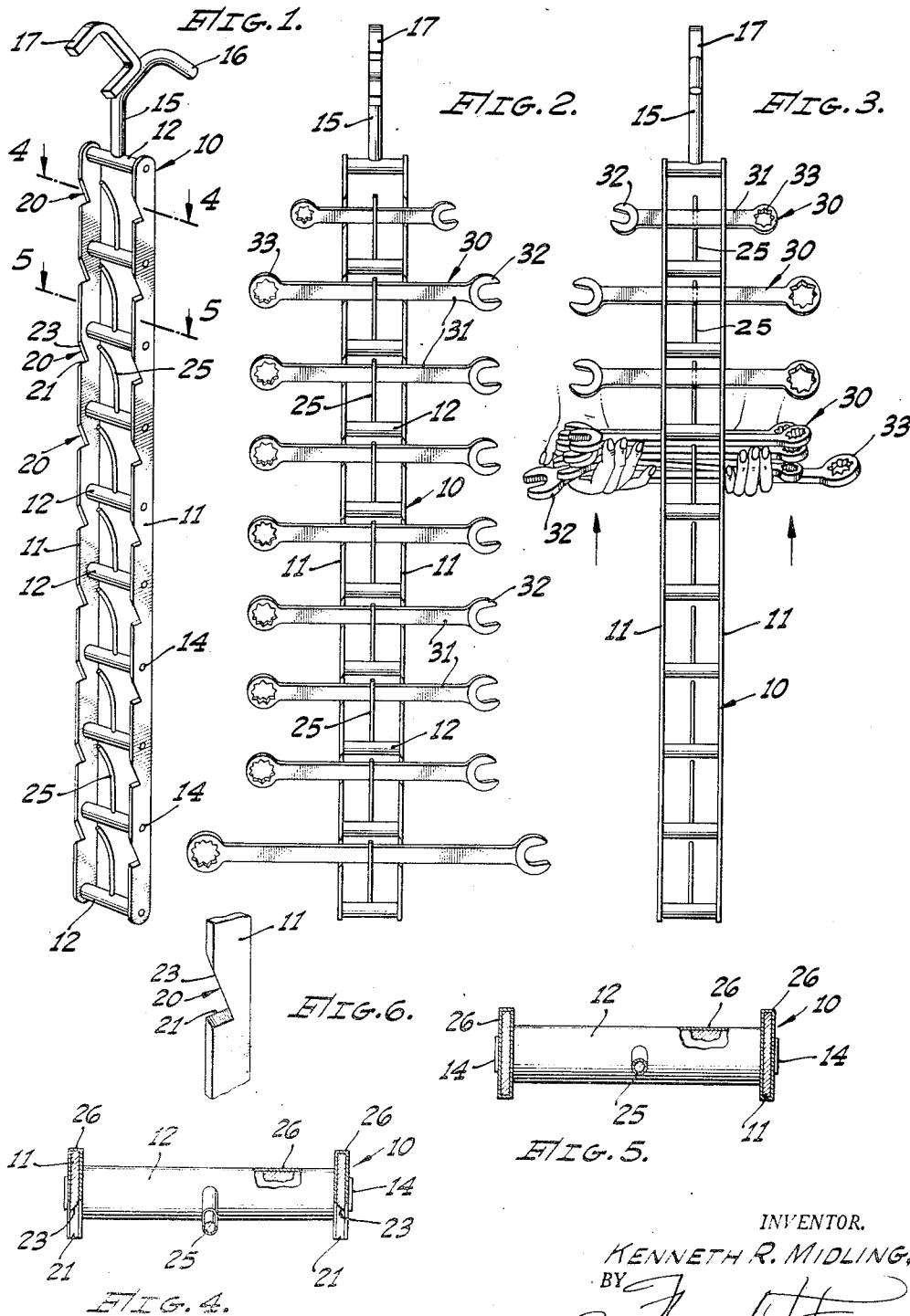
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K. R. MIDLING
ELECTROPLATING RACK

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2 Sheets-Sheet 1



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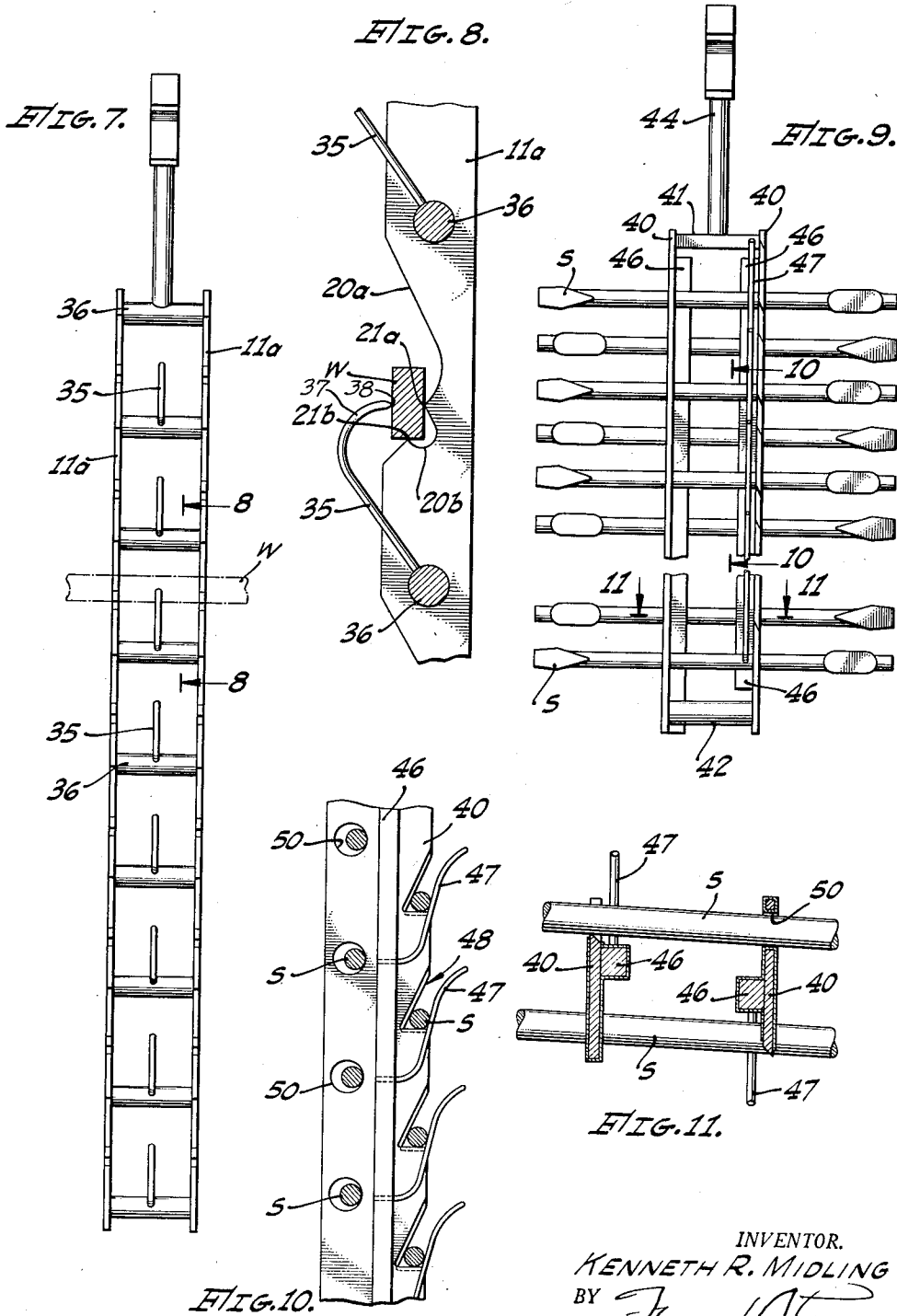
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ELECTROPLATING RACK

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3 Claims. (Cl. 204—297)

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This invention relates generally to chromium electroplating apparatus, and more particularly to racks for holding the articles to be chromium plated during the plating operation.

In the chromium electroplating of metal articles, such as steel open-end wrenches, box end wrenches, and the like, it is necessary to suspend or support the articles in the plating bath, and to make electrical connection with them by means of some electrical conductor means. It has been common practice to fashion this electrical conductor means in the form of a rack adapted to support the article in the solution, as well as to make electrical contact with it. In chrome plating, as distinguished from some other types of electroplating, it is especially necessary that a very tight, low resistance electrical contact be effected between this rack and the article to be plated. For the purpose of work pieces having a substantial ratio of length to thickness or width, such as box end wrenches, prior practice has made use of a vertical electrically conductive rack bar provided with pairs of spring fingers adapted to be engaged inside the boxes of the wrenches. The spring pressure exerted by these fingers is relied on to give the necessary electrical contact. The upper end of the bar may be provided with a large hook adapted to be engaged over and suspended from an electrical bus bar stretched horizontally over the plating tank. Such racks, however, are tedious to load and unload with articles to be plated, and moreover, the electrical contact which they provide between the work piece and the rack is variable and uncertain, with variable current densities and consequent uncertain quality control the result. Equally as undesirable is the common prior practice of wrapping a length of copper wire several times around each of a number of articles to be plated, and then suspending the resulting "string" in the bath. The wrapping and unwrapping operations are tedious, time consuming, and costly, not to mention the lack of quality control that goes with this practice.

The primary object of the present invention, therefore, is the provision of a new and improved electrically conductive plating rack, suitable for use in the chrome plating process, which rack is characterized by ease and rapidity of loading and unloading, and further by the provision of a tight and certain low-resistance electrical contact between the articles to be plated and the rack.

A further object is the provision of a new and improved plating rack particularly adapted to receive a plurality of tools of the general physi-

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cal nature as open end and box end wrenches, screw driver shanks, and the like, that is to say, tools having a shank or bar-like handle part, or a part having a substantial ratio of length to thickness or width; and it is a further object to provide a rack of such character which has the further feature that it will accommodate such articles in a wide range of sizes.

Various additional objects and features of the invention will become apparent from the following detailed description of one present illustrative embodiment thereof, reference for this purpose being had to the accompanying drawings, in which:

Figure 1 is a perspective view of a preferred embodiment of the plating rack of the invention;

Figure 2 is a front elevational view thereof, showing the rack loaded with wrenches to be plated;

Figure 3 is a rear elevational view of the rack, showing also the method of rapidly unloading the rack;

Figure 4 is a detail section taken on line 4—4 of Figure 1;

Figure 5 is a detail section taken on line 5—5 of Figure 1;

Figure 6 is a fragmentary enlargement of a portion of Figure 1;

Figure 7 is a front elevational view of a modified embodiment of the invention;

Figure 8 is a section on line 8—8 of Figure 7;

Figure 9 is a front elevational view, with a section broken away, of another embodiment of the invention;

Figure 10 is a section on line 10—10 of Figure 9; and

Figure 11 is a section on line 11—11 of Figure 9.

Numeral 10 in the drawings designates the plating rack of the invention in its entirety, the rack being generally in the form of a ladder, having longitudinal side rails 11 and transverse connecting bars 12 spaced longitudinally of the rails 11. The rails 11 are preferably straps of electrically conductive metal, as copper, and the connecting bars 12 may be solid copper rods or bars provided at their ends with reduced stud portions 14 adapted to project through suitable drill holes in the side rails 11 and to be riveted tightly to the latter, as indicated, the bars 12 being thus secured against rotation in the rails 11. The rack may have any suitable or conventional means of support, that here shown being suitable, though of course subject to modification. The present supporting means includes a rod 15 secured and

extending upwards from the upper rack bar 12. This suspension rod 15, which is electrically conductive, is bent at its top to form a usual handle 16, and has secured thereto the usual hook member 17 by which the rack may be engaged over an electrical conductor from which it is suspended in the plating bath. The members 15, 16 and 17 are conventional, as is the conductor, not shown, over which the hook 17 is to be engaged, and also the plating bath and tank. These parts are therefore omitted from the drawings, being fully within the knowledge of those skilled in the art.

The two rails 11 are provided with pairs of article engaging elements preferably in the nature of notches 20 formed by approximately horizontal inwardly extending knife-edge shoulders 21, sometimes very slightly inclined upwardly in an inward direction, and upwardly and outwardly inclined knife edges 23. The latter may conveniently make such an angle as approximately 15° with the longitudinal edges of the rails 11. The two notches 20 of each pair are in lateral or horizontal alignment with one another, and successive pairs of the notches are spaced between and alternate with the transverse connecting bars 12, as clearly indicated in Figure 1. Secured to each of the bars 12, as by being set tightly in a hole or socket drilled thereinto, is a relatively stiff resilient rod or spring 25 adapted to make firm pressure engagement with the article or work piece positioned on the shoulders 21 and against the edges 23.

The entire rack is provided with an insulation coating 26 of the usual character common in the art, such as indicated by the numeral 26 in Figures 4 and 5. This coating is scraped away on the steps or shoulder 21 and also on the article engaging edges 23, and it is preferably also scraped away on the rearward side of each spring member 25 where the latter makes contact with the article to be plated. Current flow is thus prevented between the solution and those portions of the rack which are not intended for work piece engagement, while the scraped away areas within the notches and on the springs assure the necessary electrical contact between the work pieces and the rack. The knife edges assure that substantial areas of the tool surfaces will not be mashed by the engagement with the rack, thus minimizing or almost or substantially eliminating defects in the plating owing to this cause, and which otherwise must be retouched.

Figure 2 shows the rack loaded with a plurality of wrenches 30, which in this instance are of the type having a straight shank 31 formed at one end with an open end wrench head 32, and at the other end with a box wrench head 33.

It will be observed that the shank of the wrench is placed in the rack with its flat side in engagement with the edges 23 of the notch 20, and with its lower edge in engagement with the more or less horizontal or slightly upwardly inclined shoulder edges 21, the wrench shank thus making good electrical contact with both of the knife edge elements 21 and 23 defining each of the two notches 20 in which it is engaged. The outer side of the wrench shank is then engaged by the spring member 25, which acts to hold the wrench shank tightly against and in firm electrical contact with the knife edges 23. It will be evident that the degree of electrical contact, and the pressure with which the contact is made, will be highly uniform from wrench to wrench, giving a high degree of control in the plating operation.

The spring members 25 are made quite stiff, and exert the pressure necessary to achieve the degree of low resistance contact between work piece and rack that is requisite to high quality results in the chrome plating operation. To illustrate the sizes of wrenches the rack may accommodate, the upper wrench as shown is of relatively small size, the lower wrench of relatively large size, while the intermediate wrenches are of intermediate size. The rack accommodates various other sizes equally well, as well as many other types of tools having a shank part which can be engaged on the rack in the manner of the illustrative wrenches. Of course, for still larger or still smaller work pieces, or for work pieces of modified shapes, appropriate redesign of the rack may be indicated, which however will in many cases be well within the ability of those skilled in the art without departing from the scope of the invention.

Figure 3 shows how the rack may be unloaded in one upsweeping motion of the two hands, the operation consisting simply in placing the hands first below the lowermost wrench on the rack, and then rapidly lifting the hands to gather the entire group of wrenches with which the rack is loaded. A skilled operator is able to load the rack by a similar though necessarily somewhat slower operation in a reverse direction, starting out with a load of the wrenches in his two hands, and advancing one wrench so as to be engaged in the rack as his hands pass each successive pair of notches 20.

Figures 7 and 8 show a modification in which the notches in the side rails, indicated at 11a in this instance, are of altered form providing a two-point contact instead of the knife edge engagement characteristic of the earlier described embodiment. Thus, the side rails are provided with relatively long notches or indentations 20a whose lower, upwardly and inwardly inclined portions are formed with indentations 20b so as to form two spaced article engagement points 21a and 21b. These points 21a and 21b are so spaced as to engage two surfaces of the part to be plated, for instance, the rectangular work piece *w*, as appears in Figure 8. The spring arms 35 which engage the work piece *w* are again mounted on transverse connecting bars 36, but are in this instance provided with an inwardly curved end part 37 whose pointed end 38 is adapted to make contact with the outwardly facing surfaces of the work piece *w* when mounted on the rack. By this arrangement, engagement with the work piece is reduced to two points at each rail, to which is added the single point of engagement by the spring arm 35. These point engagements eliminate the marking on the work piece almost entirely, being in this respect superior even to the knife edge notches described earlier.

Reference is next directed to Figures 9 to 11, showing still another embodiment, designed in this instance for various types of tool shanks such as screw driver blades and the like having at least one end portion of relatively small cross-section. In this instance, the rack employs two parallel strap-like electrically conductive side rails 40, interconnected top and bottom by electrically conductive bars 41 and 42, respectively, and the upper bar 41 being furnished with a suspension means 44 of the same type previously described in connection with Figures 1 to 3. Secured as by soldering, along the inner surface of each of the strap-like rails 40 is an electrically conductive bar 46 adapted to carry spring arms

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47, the spring arms projecting in opposite directions from the two bars as illustrated. Along one edge of each strap 40, adjacent to the spring arms 47, is formed a series of work-piece-engaging notches 48, which may be of the same step-like type described previously in connection with Figures 1 to 6. These notches 48 are preferably sharpened to knife edges, as clearly indicated, the same as previously described in connection with Figure 6. Each strap 40 also has, in alignment the lower knife edges or steps of the notches 48, a series of apertures 50. A work piece, such as a screw driver blade *s*, may be inserted in an aperture 50, and pressed down under spring arm 47 to engage the knife edges of the corresponding notch 48. The loading operation is rapidly accomplished, and the work piece is tightly held by the spring arm against the two seats afforded by the aperture 50 and knife-edged notch. As will appear, the capacity of the rack has been doubled in this case by utilizing both edge portions of the straps.

From the above it will be evident that the invention provides a simple electroplating rack for such work pieces as are illustrated by wrenches and screw driver blades of the type appearing in the drawings, and that the advantageous characteristics of the rack include not only improvement in quality and efficiency in the actual plating operation, brought about by closer control of current densities, but great increase in the rapidity with which the racks are loaded and unloaded, as well as rigidity and neatness with which the work pieces are supported. The rack of the present invention effects such a substantial degree of economy in loading and unloading time that up to half the over-all cost of the plating operation may be saved by its use. It will of course be evident that there is no limitation on the type of work piece which the rack may handle as to type of tool, cross-section, size, etc., beyond that it be or include an elongated, shank-like part, or otherwise stated, be or include a member having a substantial ratio of length to transverse dimension. It will also be understood that the embodiments illustrated and described are merely illustrative of and not restrictive on the broad invention, and that various modifications in design, structure and arrangement may be made without departing from the spirit and scope of the invention.

I claim:

1. An electrically conductive electroplating rack comprising a pair of parallel vertical supporting rails, electrically conductive transverse bars connecting said rails, the front edges of said rails being provided with article receiving and engaging notches, said notches being spaced between said bars, and the notches in the two rails being located in lateral alignment, so as to form article engaging pairs of notches between said bars, and article engaging spring arms mounted on and extending upwardly from said transverse

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bars between said rails, each of said spring arms reaching upwardly to the pair of notches next above, and said arms being shaped and arranged to engage and exert holding pressure against articles placed in said pairs of notches.

2. An electrically conductive electroplating rack comprising a pair of parallel vertical supporting rails, transverse bars connecting said rails, article receiving and engaging notches in the front edges of said rails, each of said notches comprising a lower knife-edge extending inwardly into the front edge of the rail at substantially right angles thereto, and an inclined knife edge extending upwardly and forwardly from the innermost point of said lower knife edge to the front edge of the rail, the notches in the two rails being located in lateral alignment, so as to form article receiving pairs of notches, and article engaging spring arms mounted on and extending upwardly from said transverse bars between said rails, each of said spring arms reaching upwardly to the pair of notches next above, and said arms being shaped and arranged to engage articles placed in said pairs of notches at points between the notches of each of said pairs.

3. An electrically conductive electroplating rack comprising a pair of parallel vertical supporting rails, transverse bars connecting said rails, article receiving and engaging notches in the front edges of said rails, each of said notches comprising a lower edge extending inwardly into the front edge of the rail at substantially right angles thereto, and an inclined back edge extending upwardly and forwardly from the innermost point of said lower edge to the front edge of the rail, said notches being spaced between said bars, and the notches in the two rails being located in lateral alignment, so as to form article engaging pairs of notches between said bars, and article engaging spring arms mounted on and extending upwardly from said transverse bars between said rails, each of said spring arms reaching upwardly to the pair of notches next above, and said arms being shaped and arranged to engage and exert holding pressure against articles placed in said pairs of notches.

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