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 [33] **Australia**
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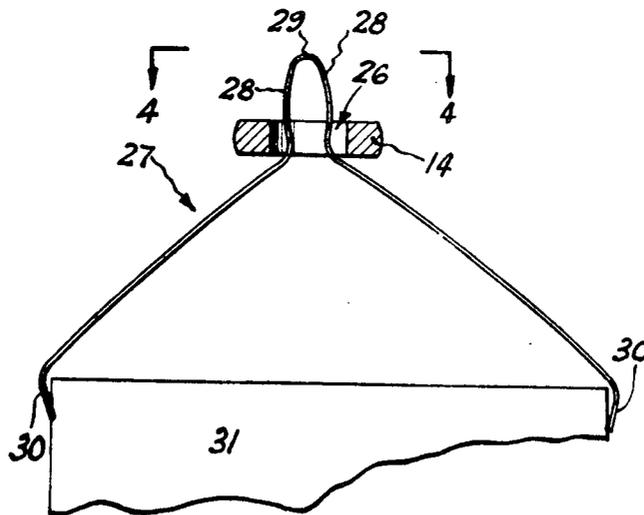
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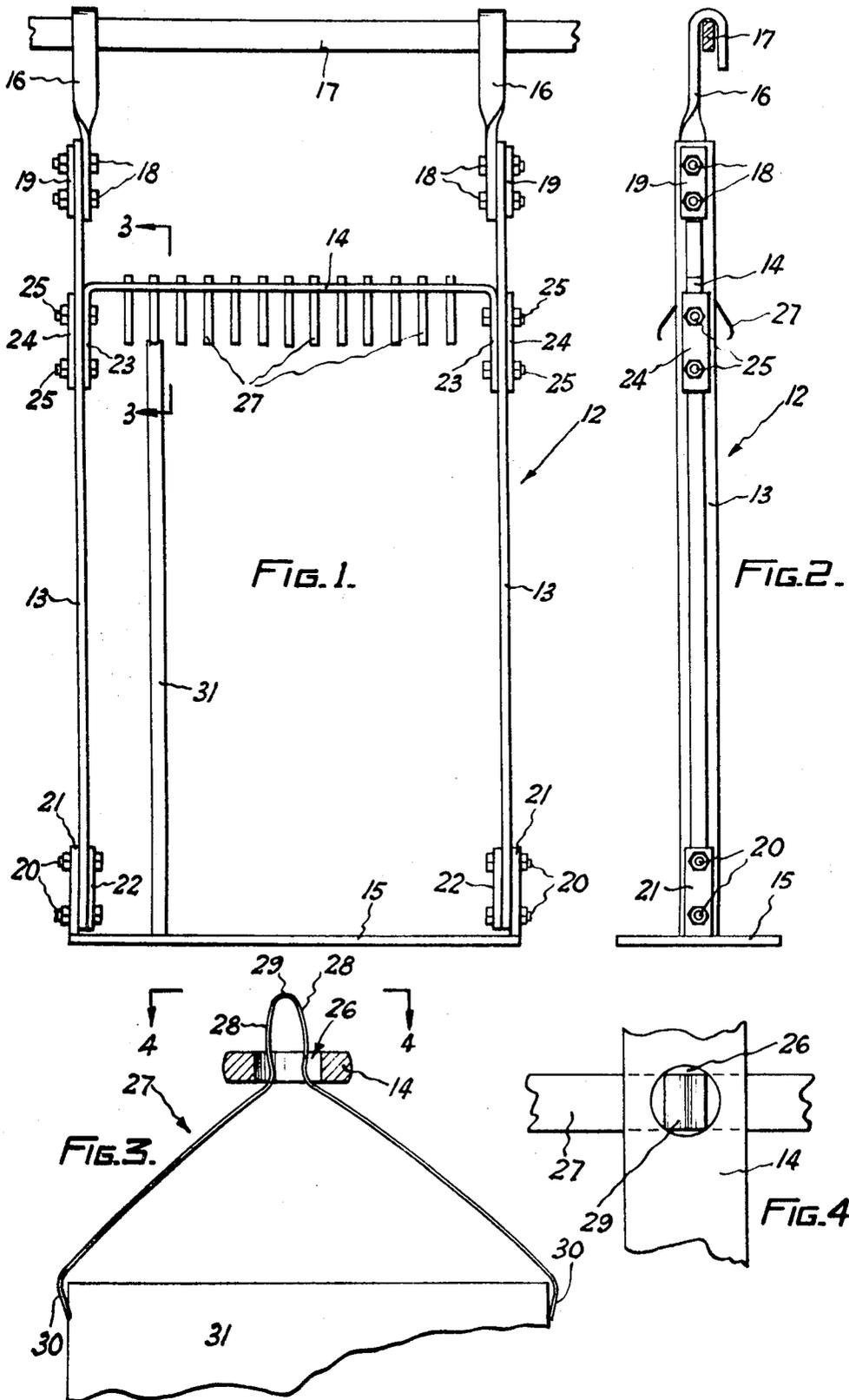
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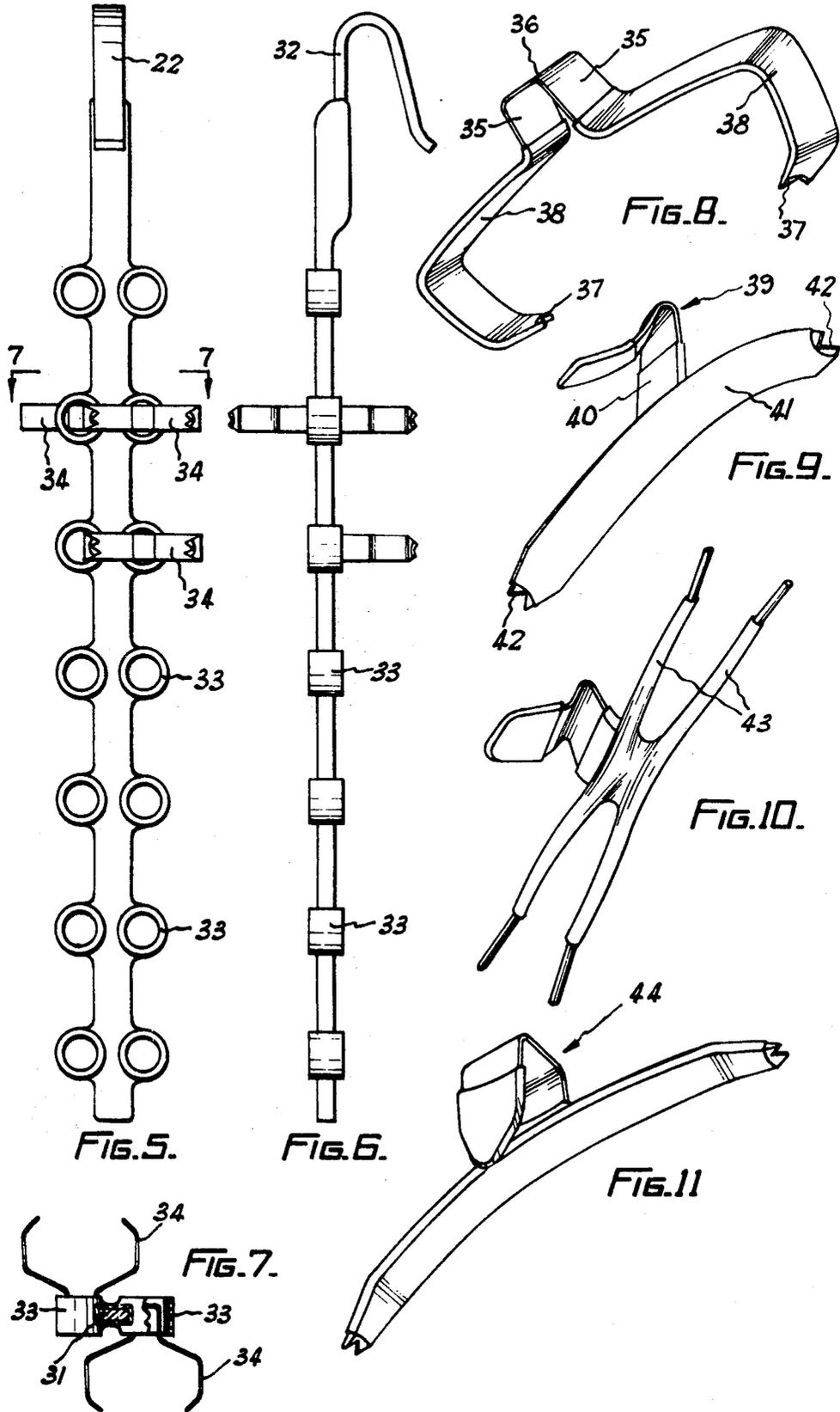
[54] **PLATING AND ANODIZING BATH RACKS**
4 Claims, 11 Drawing Figs.

[52] U.S. Cl..... 204/297 R
 [51] Int. Cl..... C23b 5/70
 [50] Field of Search..... 204/297

ABSTRACT: A plating or anodizing rack with a supporting structure having at least one socket recess through it and a detachable spring clip inserted into the recess. The clip has a U-shaped resilient body with two arms extending from a junction point, the edges of the clip making a line contact with the surface of the recess and frictionally engage it.







PLATING AND ANODIZING BATH RACKS

This invention relates to the racks used to support articles for treatment of electroplating or anodizing baths.

Such racks usually comprise a spine or frame adapted to be hung from an overhead bus bar furnished with a plurality of spring clips adapted to grip the articles to be treated.

Hitherto the spring clips have been riveted, bolted, welded or otherwise more or less permanently secured to the spine or frame.

The effective life of prior used racks is short for not only are the bath liquids usually highly corrosive, but also anodizing racks tend to be dissolved or eroded by the chemical and/or electrolytic action involved and plating racks are subject to metal buildup on all exposed metal surfaces.

Both these effects are wasteful of material and otherwise objectionable and eventually render normal racks unfit for use; in the case of anodizing racks because the mechanical strength or current carrying capacity of the rack is reduced to an unsatisfactory value and in the case of plating racks because the metal buildup on the tips of the spring clips (which are necessarily exposed to make electrical contact with the workpieces) destroys their ability to grip the articles satisfactorily. Furthermore pieces of the built up metal break free from the clips and contaminate the bath.

In view of the foregoing it has hitherto been necessary to discard anodizing racks after a short period of use and to dismantle and service plating racks at frequent intervals.

It is possible to make anodizing racks from titanium which does not corrode in the bath but the high cost of this expedient has prevented its wide spread adoption.

The problem of metal buildup on the tips of the clips of prior known plating racks has been overcome either by time-consuming manual removal of the built-up metal or by immersing the rack in a corrosive cleaning acid to dissolve the built-up metal. The clips of prior known plating racks have usually been made of stainless steel or other metal resistant to the action of such a cleaning acid but it frequently happens that the protective insulating coating on the rack itself becomes damaged, in which event, it also is attacked by the cleaning acid.

Conceivably, this could be overcome by making the entire rack of stainless steel but, once again, the high cost of material is an obstacle. Furthermore, as the insulating coating of a proportion of racks remains intact through their useful life it would be wasteful to make all racks from stainless steel.

The costs of using titanium and stainless steel as aforesaid are excessive because as a general rule hitherto each rack has been tailored to the articles to be treated so that different racks have been required for each change in product. Indeed any large anodizing or plating plant usually has a large amount of capital tied up in stocks of used racks not immediately needed by retained in store to meet possible repeat orders and the like.

Therefore it would be desirable to make use of adjustable or universal racks each able to handle a wide range of products if only as it would then be economic to use the above-mentioned materials. Also such racks would enable a desirable reduction in the stock of racks to be achieved irrespective of the material used.

Hitherto it has been proposed to make racks of an adjustable nature by using demountable frames, that is to say frames made from reusable components which may be bolted or otherwise nonpermanently secured together in a variety of ways; but this expedient is only of limited use as it does not provide for variation of the spring clips associated with each frame component.

In view of the foregoing the present invention was devised to provide racks, preferably of the demountable type, wherein the spring clips are readily removable and replaceable.

According to the invention a plating or anodizing rack is provided comprising a supporting structure, for example a spine or frame, having at least one socket recess formed in it and at least one, detachable spring clip comprising a U-shaped

resilient body, in the form of two arms extending from a junction portion, adapted to be inserted into said recess and to be retained therein by friction, and gripping means on said body adapted to engage an article to be supported by the rack; the arrangement being such that, when the clip body is inserted into said recess, the gripping means are disposed outside the recess.

The invention extends not only to a rack as aforesaid but also to the above-described clips for the rack.

According to preferred embodiments of the above-described invention, the supporting structure comprises a spine or demountable frame whereof the clip carrier component, or each of them, is a rectangular sectioned metal bar with a plurality of spaced-apart holes drilled through it disposed in a row extending longitudinally of the bar; said holes constituting the socket recesses for the clips. Alternatively, short lengths of tubing or the like may be welded or otherwise secured to the bar so as to project therefrom, in which event the bore of each piece of tubing constitutes a socket recess.

For preference the body portion of each clip is formed from a length of resilient metal strip of rectangular cross section bent into a "U" shape.

The body portion of the strip is preferably formed so that the arms naturally slightly diverge, but are brought towards each other by resilient deformation of the clip junction portion when the body portion is thrust into a socket recess.

Accordingly when a socket recess is a circular cross section (as is preferred) each of the outer edges of the clip arms makes high-pressure line contact with the side surfaces of the recess. This serves to hold the clips in place securely and to produce a good electrical connection between the clip and supporting bar in which the socket recess is formed.

The arms of the clip protruding from the recess may themselves grip the article to be treated. For example, each arm may diverge from the other rapidly outside of the recess, except for the free end portions of the arms which may be returned so that the arm tips are directed towards each other. Those tips may be formed with one or more points so that they make high-pressure point contact with an article lodged between them.

According to other embodiments of the invention only one of the clip arms may extend substantially from the socket recess in which case said one arm coacts with the corresponding arm of another clip in another socket recess to grip an article between them.

According to still other embodiments of the invention the U-shaped body portion, or rather one arm thereof, which projects from the socket recess carries more or less elaborate gripping means of any conventional kind adapted to hold an article to be treated.

Plating racks according to the invention preferably have all surfaces of the supporting structure, except those defining the socket recess, covered with a plastics insulating layer to prevent plating metal buildup thereon.

The side surfaces of the said recesses are left bare so that electrical connection may be effected with the clips, and it has been found in experiments leading to the present invention that those surfaces are partly shielded from plating currents by the clip so that metal buildup is only slow. Such metal as does buildup on the socket surface may be removed periodically by a simple reaming operation by unskilled labor.

It will be noted that the preferred embodiments of the invention, as described above, are such that the placement of an article to be treated into position imposes loads on the body portion of the clips holding it which tend to separate the clip body arms. Thus clips may be made so that they are very readily removed and replaced when unloaded, but which become tightly held in position when in use holding an article.

By way of example, several embodiments of the above-described invention are described hereinafter with reference to the accompanying drawings.

FIG. 1 is a front elevational view of an anodizing rack according to the invention.

FIG. 2 is a side elevation of the rack of FIG. 1.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1 but drawn to a larger scale.

FIG. 4 is a plan view taken on line 4—4 of FIG. 3.

FIG. 5 is a front elevation of a plating rack according to the invention.

FIG. 6 is a side elevation of the rack of FIG. 5.

FIG. 7 is a sectional view taken on line 7—7 of FIG. 5.

FIGS. 8, 9, 10 and 11 are perspective views of various spring clips according to the invention usable as components of plating anodizing racks according to the invention.

The plating rack illustrated in FIGS. 1 to 4 comprises a demountable frame 12 comprising longitudinally slotted side members 13 of titanium and upper and lower crossmembers 14 and 15 respectively.

The upper end of each side member 13 is provided with a suspension hook 16 whereby the rack as a whole may be suspended from a bus bar 17 extending above an anodizing bath with the main part of the rack immersed in the electrolyte.

The suspension hooks 16 are secured to the side members 13 by through-bolts 18 and clamping plates 19.

Similarly the lower crossmember 15 is secured to the side members 13 by means of through-bolts 20 extending through upwardly directed affixture lugs 21 on the crossmember 15 and clamping plates 22.

The upper crossmember 14 is likewise secured to the side members 13 by means of downwardly directed affixture lugs 23, clamping plates 24 and through-bolts 25. It will be clear that the upper member 14 may, therefore, be positioned at any desired spacing from the lower member 15 within the limits imposed by the lengths of the side members 13.

The upper crossmember 14 is pierced by a row of holes 26 each of which constitute a socket recess for the reception of a spring clip 27.

Each of the clips 27 is made from a length of resilient metal strap of rectangular cross section and comprises a U-shaped body comprising two arms 28 extending from a junction portion 29 able to be inserted into a corresponding one of the recesses 26 to be retained therein by friction between the arms 29 and the inner surface and/or rim of the socket recess. In the embodiment of the invention now being discussed the arms 28 are prolonged and terminate in inwardly directed tips 30 adapted to grip the upper end of an article 31 to be anodizing.

The plate rack illustrated by FIGS. 5 and 7 comprises a metal spine 31 provided with a suspension hook 32 at its top end and with a plurality of short tubular sockets 33 welded or otherwise secured to it. The spine 31 and the outer surfaces of the sockets 33 are coated with a corrosion resistant, plastics, insulating coating of known kind. The bore of each of the sockets 33 constitutes a socket recess adapted to receive and retain spring clips 34.

Each of the clips 34 may be the same or similar to the clip illustrated by FIG. 8 and, in that event, comprise a resilient metal strap formed into a U-shaped body comprising two arms 35 and a junction portion 36. In this instance also the arms 35

are extended and terminate in inwardly directed tips 37 adapted to hold an article to be placed between them. The clip body and the tips of its arms are bare but the prolongations of the arms 35 are coated with corrosion resistant plastics material at 38.

The clip illustrated by FIG. 9 comprises a resilient U-shaped body 39 of which one arm 40 projects for the support of a crossbar 41 having outwardly directed tips 42. The arm 40 and the crossbar 41 (except for its tips 42) are coated with plastics material.

The clip of FIG. 9 is intended to coact with a neighboring clip of the same general construction for the support of an article to be plated and in this regard differs from the clip of FIG. 8 which is adapted to grasp an article without assistance from another clip.

The spring clip of FIG. 10 is similar to that of FIG. 9 except in that the crossbar 41 is replaced by two resilient wire cross-bars 43 the ends of which are uncoated for contact with the article or articles to be supported by the clip.

The clip of FIG. 11 is basically the same as the clip of FIG. 9 except for a variation in the shape of its U-shaped body 44 to suit a somewhat larger socket orifice than that to which the clip of FIG. 9 is suited.

It must be emphasized that the above-illustrated clips are only examples of a virtually limitless variety of clips adapted to the support of all manner of articles required to be anodized or electroplated. In every instance, however, a clip according to the invention may be distinguished because of its U-shaped body portion whereby it is secured in its associated socket orifice. Furthermore, it will be appreciated that the rack frame is also subject to great variety in design depending upon the article to be treated and, therefore, the examples of the invention illustrated and described above are not to be taken as limiting, the scope of the invention being as defined in the accompanying claims.

I claim:

1. A plating or anodizing rack comprising a support structure having at least one socket recess extending through it and at least one detachable spring clip comprising a U-shaped resilient body, in the form of two arms extending from a junction portion, inserted into said recess and retained therein by friction, gripping means extending from said body adapted to engage an article to be supported by the rack; the arrangement being such that the gripping means are disposed outside said recess and the edges of the body make line contacts with the surface of said recess.

2. A rack, according to claim 1, wherein said gripping means comprise an integral extension of at least one of said arms.

3. A rack, according to claim 1, wherein said supporting structure comprises a plurality of frame members bolted or otherwise detachably secured together.

4. A rack, according to claim 1, wherein said gripping means are such that engagement with the article thereby tends to spread the clip arms apart.

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