

[72]	Inventor	Wendell Azbell 2877 Streamside Drive, Columbus, Ind. 47201
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Primary Examiner—James A. Leppink
Assistant Examiner—Joseph H. McGlynn
Attorney—Trask, Jenkins & Hanley

[54] **ELECTROPLATING TANK SADDLE**
12 Claims, 4 Drawing Figs.

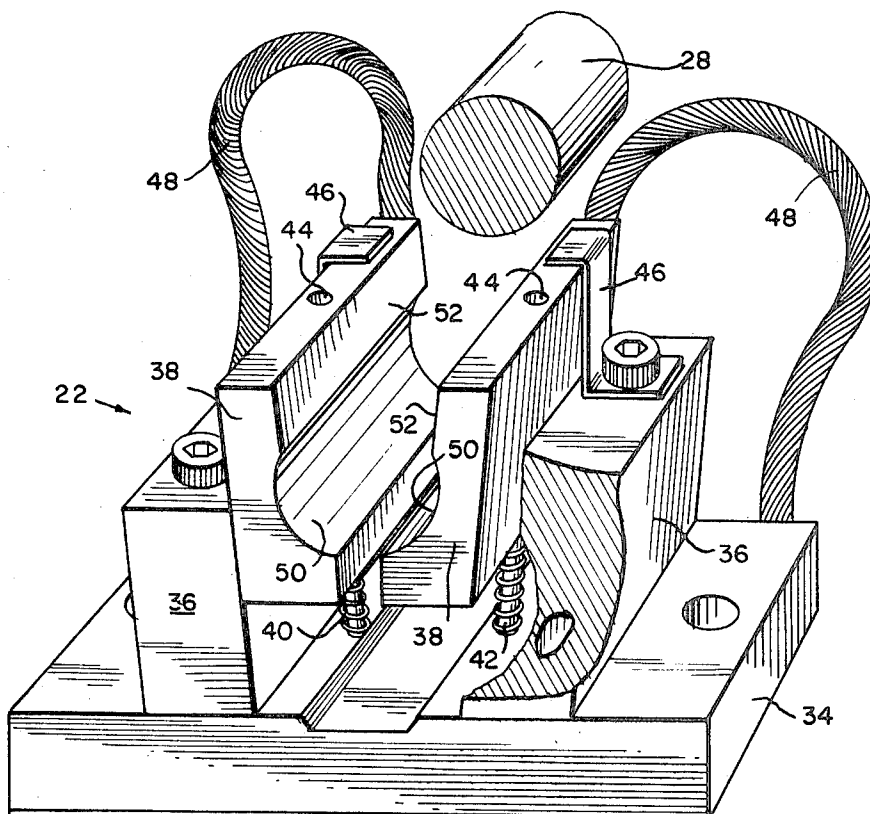
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[51]	Int. Cl.	H01r 13/62
[50]	Field of Search	339/64 —66, 255, 273, 274

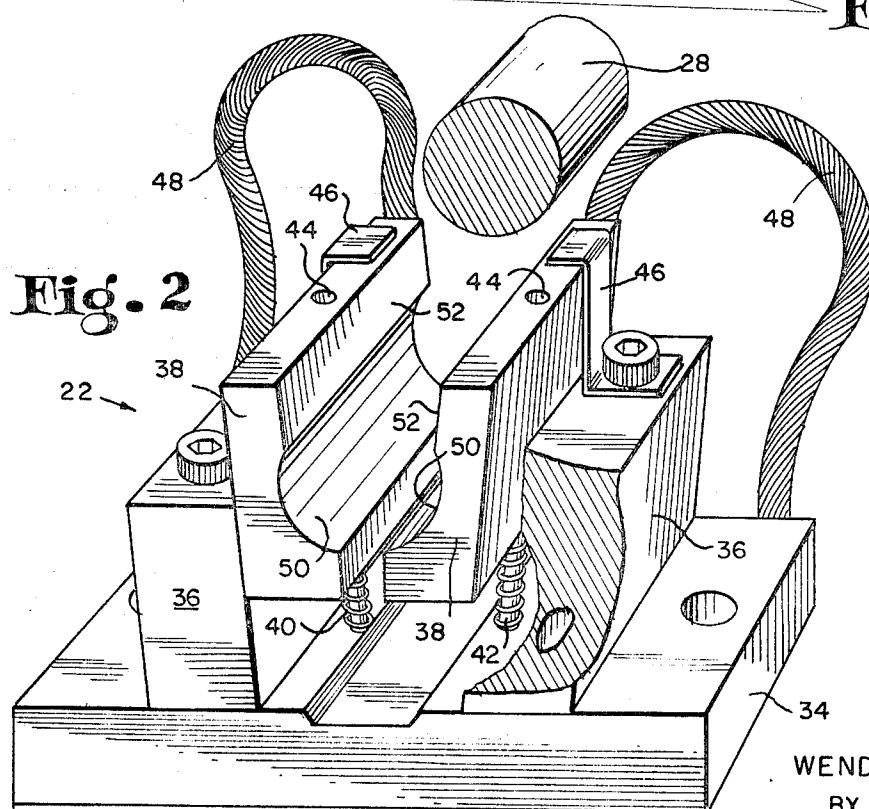
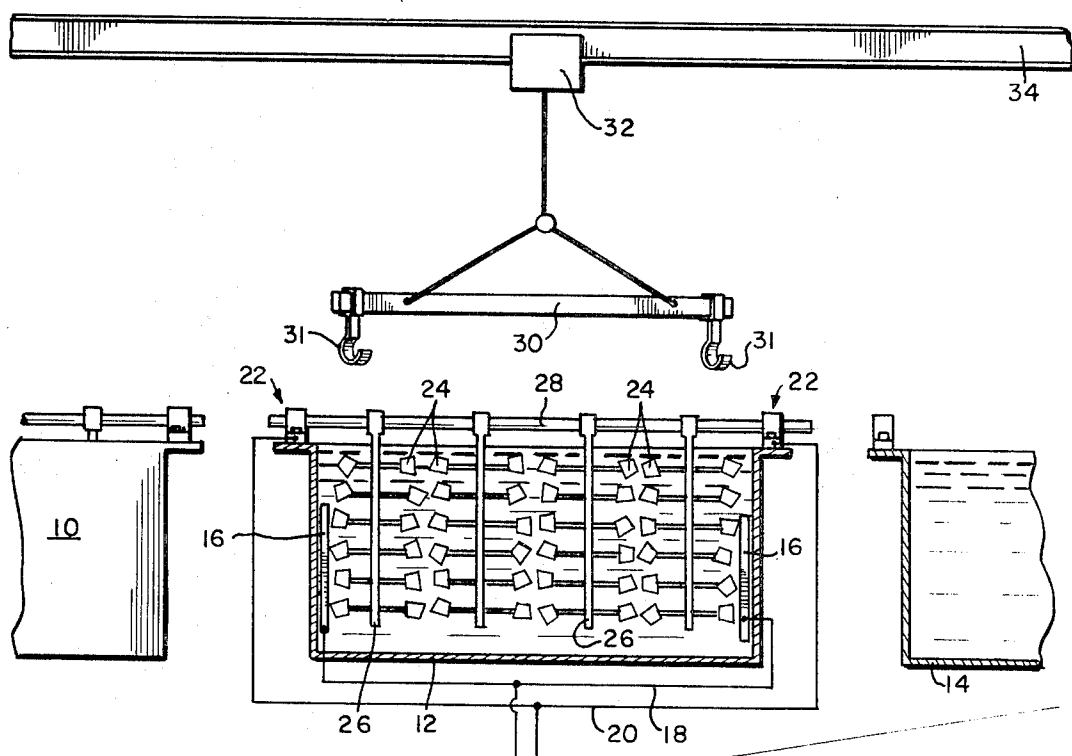
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ABSTRACT: An electroplating tank saddle for supporting, and making electrical contact with, the support bar on which racks of parts to be plated are carried. The saddle has jaws which are spring pressed to upwardly open position to receive a support bar, and which close in response to the weight of such bar and its load to grip the support bar and make good electrical conductive engagement therewith. The jaw mounting permits the jaws to tilt or otherwise adjust themselves to accommodate misalignment commonly resulting from bending of the support bar under its load and from bending of the tank rim on which the saddle is mounted. The good electrical contact provided by the saddle under practical conditions improves the plating operation and reduces the reject rate.





INVENTOR
WENDELL AZBELL

BY
Frank, Jenkins & Hanley
ATTORNEYS

Fig. 3

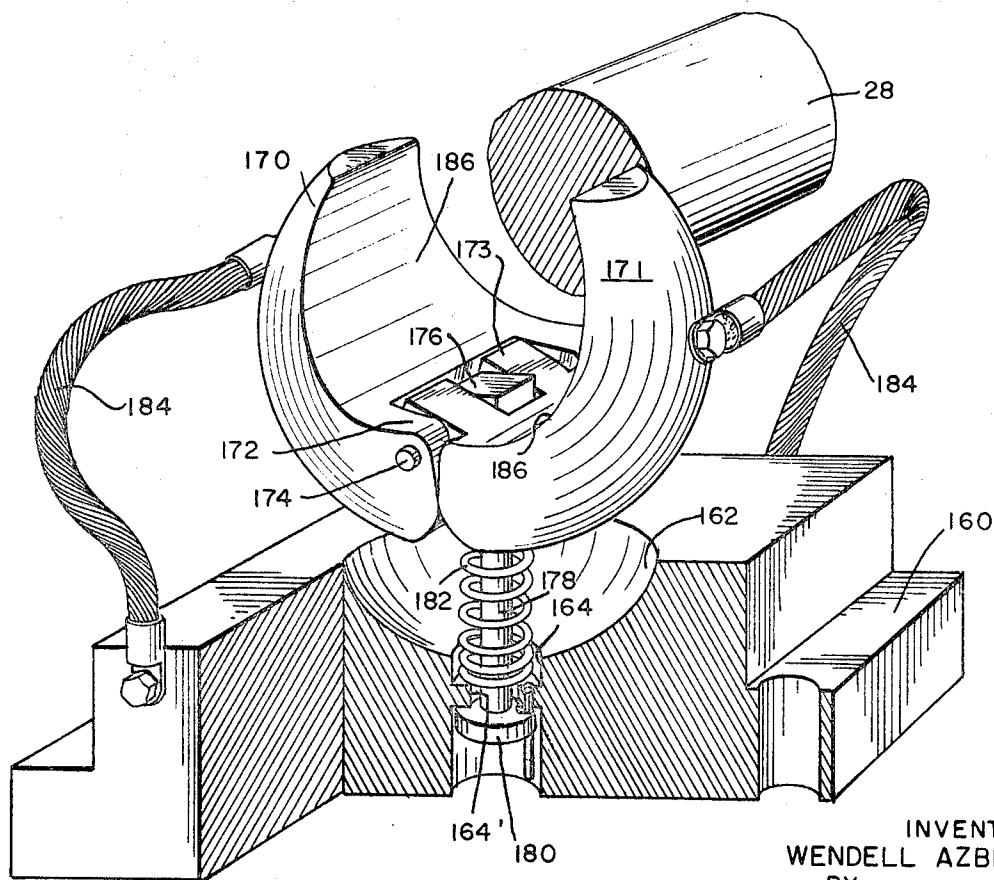
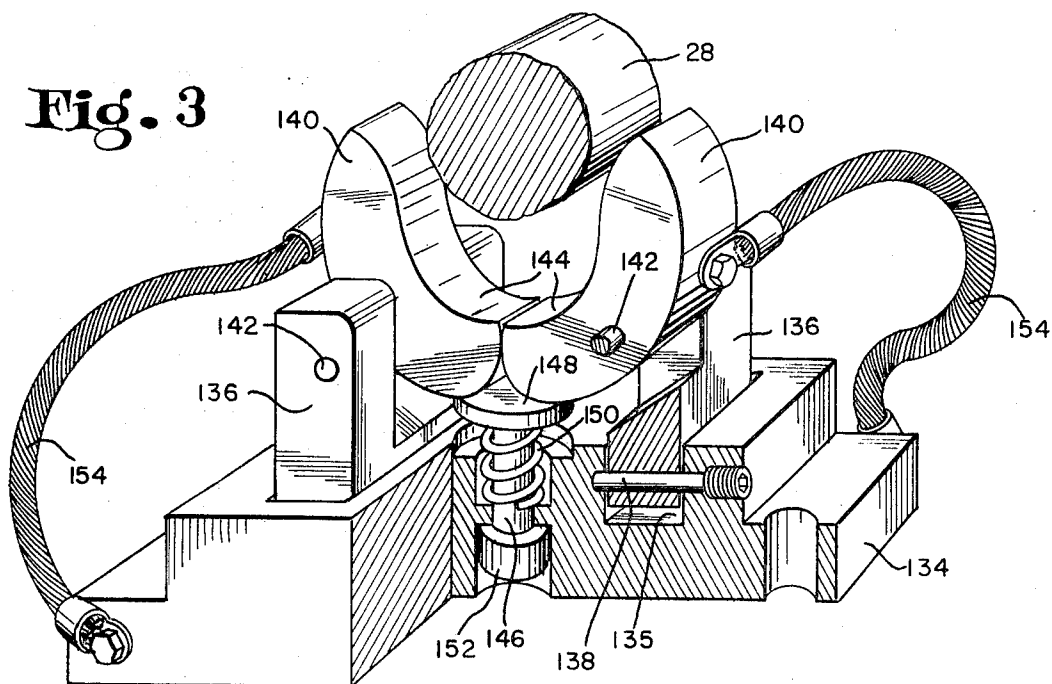


Fig. 4

INVENTOR
WENDELL AZBELL
BY

Irish, Jenkins & Hanley
ATTORNEYS

ELECTROPLATING TANK SADDLE

This invention relates to an electroplating tank saddle for releasably supporting, and providing good electrical contact with, the support bar on which racks of work parts to be plated are carried.

In commercial plating operations, parts to be plated are mounted on racks which in turn are mounted on support bars to form a load assembly, and such load assembly is transferred in sequence from one to another of a series of processing tanks which include one or more electroplating tanks. At each electroplating tank, the support bar is supported at its ends in a pair of saddles mounted on the rim of the tank, and plating current is desirably fed to the load by way of the saddles and bars. The bars with their load are commonly transferred by an overhead lift conveyor which lifts and lowers the bars vertically out of and into the saddles, and the saddles should therefore provide for ready insertion and removal of the support bars.

Plating tank saddles commonly used at present are grooved blocks of copper or other conductive metal, which provide adequate physical support for the bars and permit their ready insertion and removal. Such grooved blocks might make satisfactory electrical contact with the support bars if the bars and the saddles were in exact alignment. In practice, however, it is not possible to maintain such alignment, especially because the bars bend under load, and the tank rims on which the saddles are mounted tend to become bent and misaligned.

In accordance with the present invention, a plating tank saddle comprises bar supporting and contacting means conveniently in the form of jaws which include supporting and contacting portions. The jaws are biased to open position and are closed by downward engagement of a bar with the support portions of the jaws, to press the contacting portions into good electrical contact with the bars over a large area in response to the weight of the support bar on the jaws. The jaws are mounted for limited tilting or universal movement with respect to their supporting structure, to permit them to compensate for bending of the bar and misalignment of the saddle mounting while still making good electrical conductive engagement with the bar.

In a preferred embodiment, the jaws are mounted between downwardly converging guides which force them together against the bar when they are pressed downward in the guides by the weight of the support bar and its load; and the jaws engage the guides on planar faces which permit them to tilt slightly in such guides to provide the desired compensation for bending and misalignment. In one modification, the jaws are pivotally mounted for movement into gripping engagement with the support bar under the weight of the bar, and the pivot supports are themselves mounted for limited tilting movement in the planes of the pivot axes to provide the desired compensation. In another modification, a pair of jaws hinged together at the bottom are supported in a spherical socket which forces the jaws together when the weight of the bar presses them into it and which provides limited universal movement for the jaw assembly to compensate for bending and misalignment.

The accompanying drawings illustrate the invention. In such drawings

FIG. 1 is a diagrammatic view showing a series of tanks and associated equipment of a plating installation;

FIG. 2 is an isometric view of a preferred plating tank saddle embodying the invention;

FIG. 3 is an isometric view of a modified plating tank saddle embodying the invention; and

FIG. 4 is an isometric view of another modified saddle embodying the invention.

The plating installation shown in FIG. 1 comprises a series of tanks 10, 12 and 14 containing solutions in which the parts to be plated are immersed at successive steps of the plating process. For applying a single plating coat, the equipment may comprise a cleaning tank 10, a plating tank 12, and a wash

tank 14. The plating tank contains a plating bath in which are immersed anodes 16 which serve to replenish the metal plated out of the bath, and these are connected by an electrical conductor 18 to one terminal of a plating circuit. The opposite side 20 of the plating circuit is connected to one or both of work-supporting saddles 22 mounted on the rim of the tank 12 at its opposite ends. Plating circuits are high-amperage, low voltage circuits which require heavy conductors and highly conductive connections.

The parts 24 to be plated are mounted on racks 26 which are hung on a support bar 28 adapted to be supported in the saddles 22. A lift and conveyor is provided for transferring support bars 28 and their workloads successively from one tank to the other. As shown, this comprises a lift bar 30 having hooks 31 at its ends to engage a support bar 28 inwardly of its ends, carried by a hoist 32 mounted for movement along an overhead conveyor track 34.

The saddle 22 shown in FIG. 2 comprises a base 34 on which are mounted a pair of inclined blocks forming guides 36. The jaws engage the guides on planar faces and are engaged over guide pins 42 fixed in the base 34 and extending upward through loosely fitting guide holes 44 in the jaws 38. Springs 40 urge the jaws upward to open position, and upward movement of the jaws is limited by stop brackets 46 mounted on the guides 36. Each jaw 38 may be connected to the base 34 by one or more flexible cables 48. Current supply to the base 34 from the plating circuit 20 will be conducted to the jaws 22 both by such cables 48 and by the large area of surface contact between each jaw 38 and its guide 36.

Each jaw 38 is formed with a bar-engaging seat 50 which includes a lower portion for supporting a bar placed in the jaws, and includes an additional contact portion, the jaw as a whole being adapted to make contact with a support bar 28 over a large surface area. Each seat 50 terminates at its upper edge at a guide face 52, and the two guide faces 52 are spaced and inclined to facilitate and guide the entry of a support bar between the jaws 38 and to the seats 50.

In use, when a loaded support bar 28 carried by the hooks 31 of the lift bar 30 is lowered into the plating tank, the ends of the bar 28 enter between the guide faces 52 of the jaws 38 and engage the lower portions of the jaw seats 50. The weight of the bar 28 then depresses the jaws 38 between the inclined guides 36, which force the jaws 38 together into gripping engagement with the bar 28. The weight of the bar and its load acts to insure tight engagement and good electrical contact over large areas between the bar 28 and the jaws 38 and between the jaws 38 and the guides 36, and thus establishes a good electrical conduction path from the plating circuit line 20 to the support bar 28, and through it to the racks 26 and the parts 24 to be plated.

When the plating step is completed, the lift hooks 31 are engaged with the bar and the hoist operated to lift the loaded bar 28 from the saddles. Upward movement of the bar 28 raises the jaws 38 toward their open position where they release the bar for transfer to the next tank. A new loaded bar 28 is then lowered into the open saddles and its weight causes them to close and make good electrical conductive engagement with the new bar.

The planar faces between the jaws 38 and the guides 36 are inclined from the vertical by a relatively small angle, which may be of the order of 5°. This allows the jaws 38 to tilt with respect to the guides 36 and the base 34 to compensate for bending of the support bar 28 without losing good electrical contact between the jaw 38 and the guides 36 or between the jaws 38 and the bar 28.

In practice, conventional saddles in the form of grooved blocks frequently become heated from the resistance of poor electrical contact between the saddle and the support bar, and the reject rate of parts plated while carried on support bars in such conventional saddles is relatively high. Saddles in accordance with the present invention, made as shown in FIG. 2, do not become heated, and the reject rate of parts plated while carried on support bars in such saddles is greatly reduced.

The modified saddle shown in FIG. 3 comprises a base 134 provided with slots 135 for the reception of mounting blocks 136 mounted for limited tilting movement on transverse pivot pins 138. The upper ends of the mounting blocks 136 are centrally notched, and a pivoted jaw 140 is mounted in the notch of each such block, on a pivot pin 142. Each jaw 140 has a bar seat 144 at its inner face, so shaped and positioned with respect to the pivot pins 142 that it moves into gripping engagement with a bar 28 when such bar is rested in the channel formed by the seats 144. The weight of the bar on the lower or support portions of the seats 144 causes the jaws 140 to tilt inward about their pivots 142, and this presses additional portions of the seats against the bar to make good electrical conductive engagement between the jaws and bar. The jaws are normally urged to open, outwardly pivoted position as shown in FIG. 3 by a spring pressed plunger 146. The plunger 146 is mounted in a suitable shaped central bore in the base 134, has a jaw-engaging head 148, is urged upward by a spring 150, and is retained by a cap 152 secured to its lower end.

Each jaw 140 may be connected by one or more flexible cables 154 to the base 134 to establish a direct electrical connection between such base 134 and each jaw 140. Additional, electrically conductive paths are formed by the mounting connections from the base to the mounting blocks 136 and from them to the jaws 140.

This modified saddle of FIG. 3 operates in a manner similar to that of FIG. 2. When a loaded bar 28 is lowered into the jaws 140 of the saddle, the weight of such bar against the lower portions of the seats 144 of the jaws tilts such jaws inward into tight gripping engagement with the bar 140 and forms a good electrical conductive connection between the bar 28 and the jaws 140. The tilt mounting of the mounting blocks 136 permit the jaws 140 to tilt in the planes of the pivot pins 142, to compensate for any bending or misalignment of the bar 28 or saddle mounting, and to permit the desired good electrical connection to be made despite such misalignment.

The modified saddle shown in FIG. 4 comprises a base 160 with mounting flanges at its ends, and formed at the top with a central generally spherical socket 162. A cylindrical cavity 164 at the bottom of the socket communicates with a bore 164' running through the bottom of the base 160. A pair of jaws 170 and 171 are supported in the socket, and have spherical lower faces for cooperation with the spherical seat 162. The two jaws 170 and 171 are provided with hinged knuckle portions 172 and 173 by which they are hinged together by a hinge pin 174. Such pin also connects them to the rectangular head of a mounting pin 178 which extends down through the bore 164 and has an end cap 180 fixed on its lower end. A spring 182 about the pin 178 urges the jaw assembly upward to unseat it from the socket. The jaw assembly is then free to align itself with a bar as the bar is placed in the jaws and presses them down into the socket. The jaw assembly is held against rotation from bar-receiving position by a pin 181 fixed in the base 160 and loosely engaged in a notch in the end cap 180.

The jaws have inner faces 186 which include lower portions for supporting the bar and additional portions to increase the area of electrical contact with a bar. The jaws may be connected by one or more cables 184 to the base 160. In unseated position as shown, the jaws are free to open to receive a bar between such face 186.

When a loaded bar 28 is placed between the jaws 170 and 171, the weight of the bar presses the jaws downward against the spring 182 and into seated position in the socket. In such seating movement the jaw assembly aligns itself with the bar and the jaws engage the bar over large areas of the faces 186 to make a good electrical conductive connection between the bar and the jaws, and between the jaws and the socket. The plating operation then occurs. When it is completed, the bar 28 is lifted out of the jaws, and the jaws are again lifted by the spring so that they are free to open to release the bar and to receive another bar and are free to align themselves with the new bar as they are again pressed down into the seat by the new bar.

In all modifications, the saddle comprises jaws which are normally disposed in open bar-receiving position, and in such alignment with respect to the tank that a loaded bar is readily dropped into and between the jaws by the lift and conveyor mechanism. The jaws are spring pressed upward to a bar-receiving position, and under the weight of the loaded support bar, the jaws automatically engage the bar over a large area, align themselves with the bar, and establish good electrical conductive contact with it. The jaw mounting is such that as the jaws move downward against the biasing means they are free to tilt to a limited extent sufficient to compensate for bending of the support bar 28 under its load and for misalignment of the supporting structure on which the saddles are mounted. The resulting improved electrical connections facilitate operation of the plating apparatus and produce more uniform and satisfactory plating results.

I claim:

1. A plating tank saddle for supporting and making electrical connection with a plating load support bar, comprising

a pair of jaws having opposing faces defining upwardly open horizontal groove adapted to receive edgewise a plating load support bar lowered into the same from above,

mounting means supporting said jaws for opening and closing movement about a bar placed therein and for limiting tilting movement in the plane of the bar to permit the jaws to align themselves with a bar which is bent under its load, said jaw faces including elongated bar-engaging seats having bottom portions to receive the weight of the bar and side portions positioned to close about the sides of the bar when the jaws are closed, said faces being shaped to make electrical contact with the bar over an elongated large surface area of the bar when the jaws are closed,

said mounting means normally supporting said jaws in an upwardly open position in which said faces are spaced to freely admit a bar from above and being constructed and arranged to cause the jaws to move in response to the force of the bar in a path to close the jaws about the bar and force the bar-engaging seats into electrical contact with the bar over said elongated area, the jaws being free to tilt during such movement to align the faces for such full engagement with a bar which is bent under its load or engagement with slightly misaligned.

2. A plating tank saddle as in claim 1 in which said jaw faces include undercut portions which overlie portions of the bar when in closed positions, such overlying portions causing the bar to lift the jaws toward open position as the bar is lifted from seated position in the jaws.

3. A plating tank saddle as in claim 1 in which said mounting means includes downwardly converging inclined guides, and said jaws are mounted for movement along said guides and have a raised open position thereon, means to hold the jaws in said open position in the absence of a support bar, the jaws being moved downward along the guides by engagement of a support bar in the jaws and the jaws being thereby forced inward by the guides into conductive engagement with the bar, the jaws being free to tilt relative to the guides during such movement to compensate for limited misalignment of the bar.

4. A plating tank saddle as in claim 1, comprising a pair of spaced guides, having opposed, downwardly converging guide faces, said bar-clamping jaws being mounted between said guides in guided relation with said faces, means biasing said jaws upward along said faces to raised open position,

said jaws being shaped to freely receive a support bar therebetween when in raised position and having portions underlying the bar to be engaged by the bar to move the jaws downward against said biasing means under the weight of the bar and its load,

said guides being inclined to force the jaws into electrical conductive engagement with the bar in response to such downward movement, the guides and jaws interengaging on planar faces which permit the jaws to tilt on the guides to compensate for limited bar misalignment.

5. A plating tank saddle as in claim 1 in which

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said bar-clamping jaws are mounted for pivotal movement on parallel axes and the opposed faces thereof are shaped to engage a support bar in supporting and electrically conductive relation between said axes,

said jaws having an upwardly tilted open position in which said faces are disposed to freely release and receive a bar therebetween, and being movable therefrom by engagement of the bar to a closed position,

said pivotal axes being so positioned that in said closed position the downward force imposed on the jaws by the weight of the bar urges said jaw faces into electrically conductive engagement with the bar.

6. A plating tank saddle as in claim 5 in which the bar-clamping jaws are mounted both for pivotal movement toward and away from the support bar and for tilting movement parallel with the support bar, to compensate for bending of the bar.

7. A plating tank saddle as in claim 5 in which the bar-clamping jaws are mounted for pivotal movement on support blocks which are themselves mounted for tilting movement in the planes of said pivotal axes.

8. A plating tank saddle as in claim 1 in which said bar-clamping jaws are pivotally interconnected below said seats, said jaws having downwardly convex support faces, and said mounting means having supporting seat portions shaped and disposed to engage said support faces outwardly of the pivotal interconnection between the jaws and thereby to urge the jaws to closed position when a load support bar is engaged in said bar-clamping jaws, and means biasing said jaws to open position.

9. A plating tank saddle as in claim 8 in which said supporting seat portions form a spherical seat in which the intercon-

nected jaws have limited universal movement.

10. A plating tank saddle for supporting and making electrical connection with a plating load support bar, comprising a mounting base adapted to be supported in fixed relation with a plating tank, bar supporting and contacting means forming an upwardly open horizontal channel for the downward reception of a loaded support bar and shaped to make electrical conductive engagement with the bar over an elongated large area of contact,

said supporting and contacting means being mounted for limited movement relative to the base, including both vertical movement and tilting movement in the plane of the channel,

biasing means normally biasing said supporting and contacting means upward from the base,

said supporting and contacting means being movable against said bias under the weight of a loaded bar to align itself with the bar and to establish an electrical conductive path from the bar to said means and the base.

11. A plating tank saddle as in claim 10 in which said support and contacting means includes a pair of jaws mounted for opening and closing movement relative to the bar, and said biasing means both urges the jaws to open position and to a predetermined bar-receiving position relative to the base.

12. A plating tank saddle as in claim 10 in which said base comprises a spherical socket, and said support and contacting means has a spherical surface for seated engagement in said socket, is normally biased upward relative to the socket, and is free to align itself with a bar placed therein as the weight of the bar presses the same into seated engagement with the socket.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,594,697 Dated July 20, 1971

Inventor(s) Wendell Azbell

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, Claim 1, line 42, "engagement with" should read -- otherwise --.

Signed and sealed this 4th day of January 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents