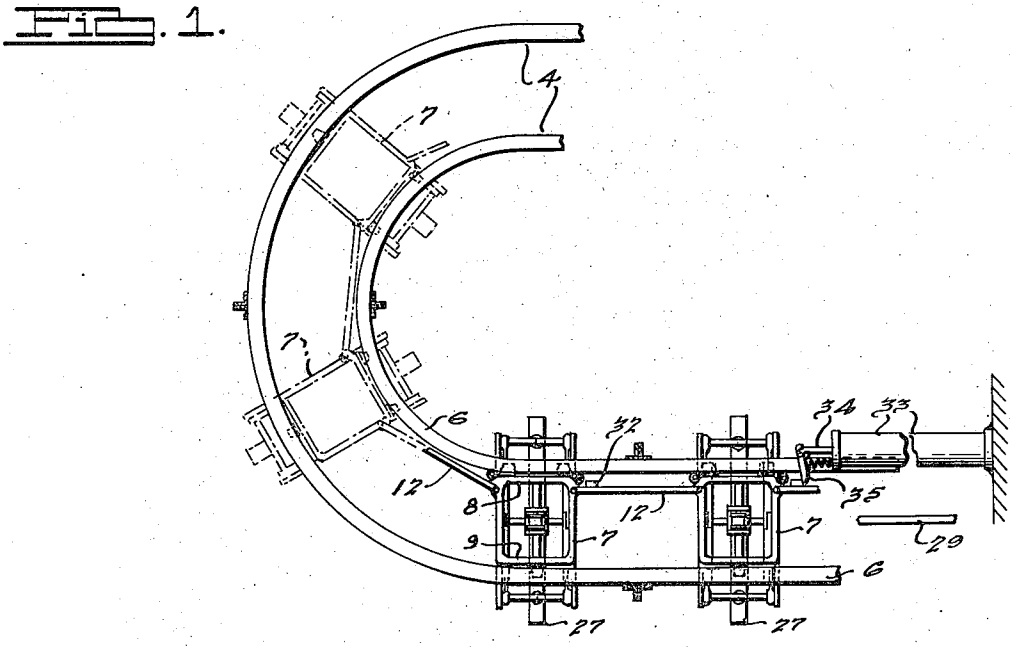
June 6, 1944. J. V. DAVIS 2,350,496

DIPPING MECHANISM

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Fig. 1.



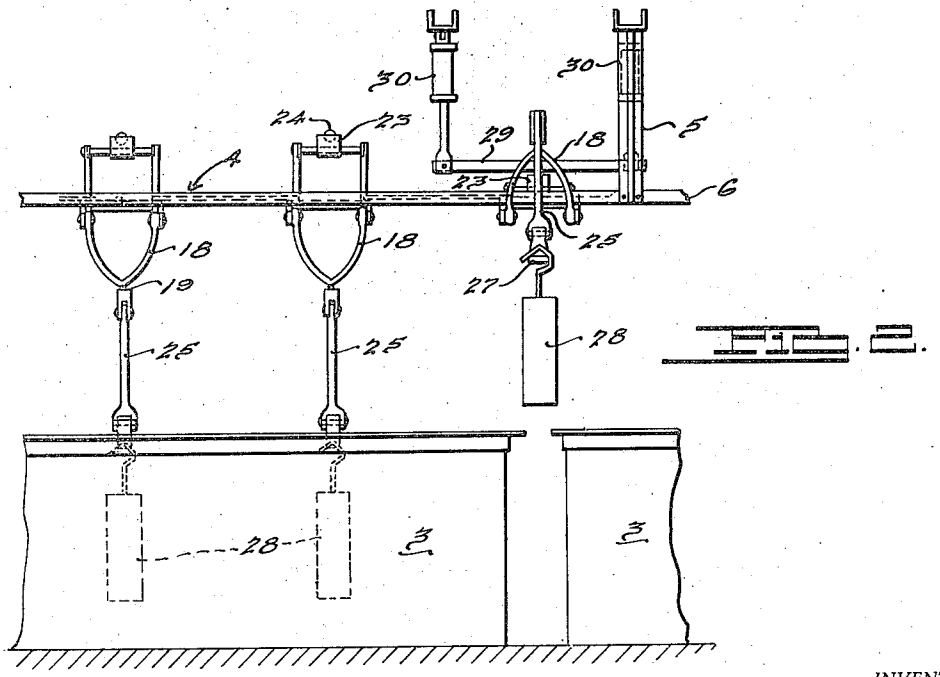


Fig. 2.

INVENTOR
JOHN V. DAVIS

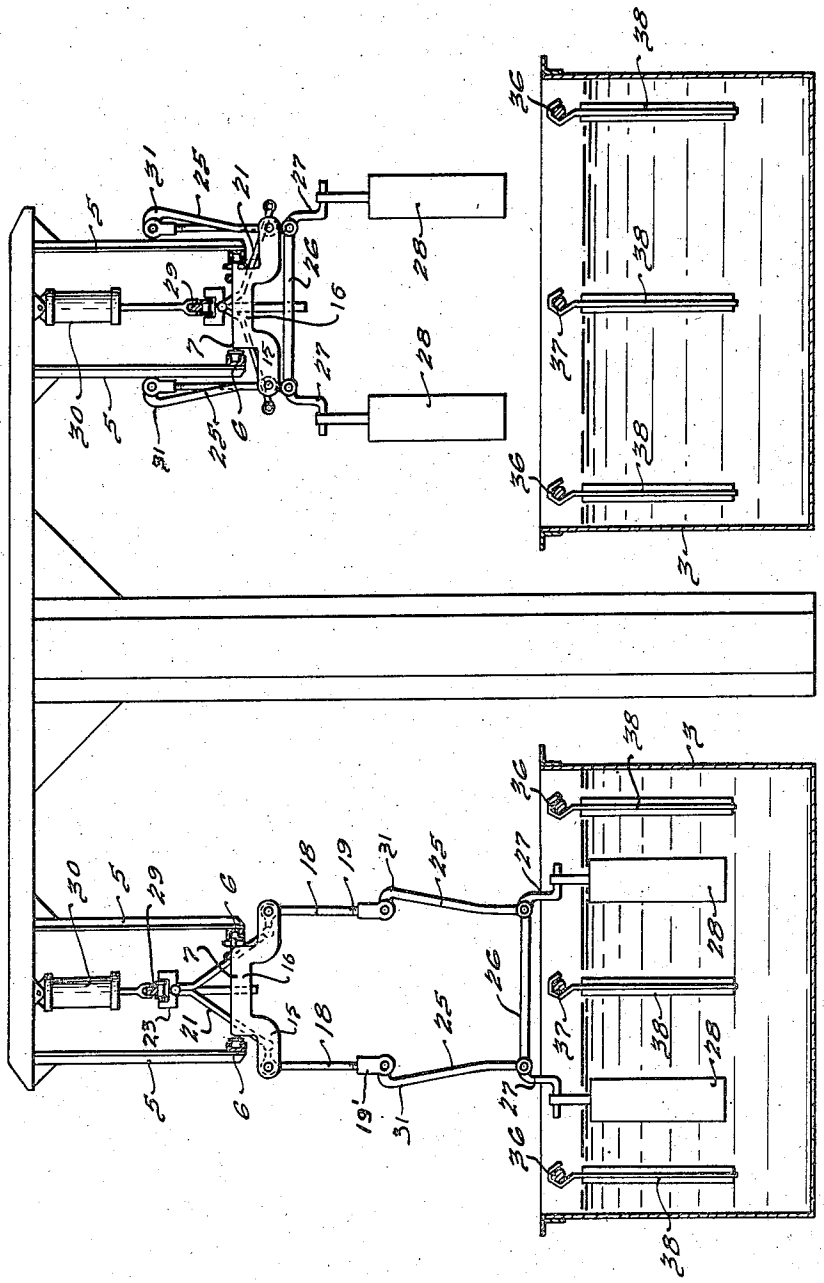
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DIPPING MECHANISM

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Fig. 2.



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DIPPING MECHANISM

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Fig. 4.

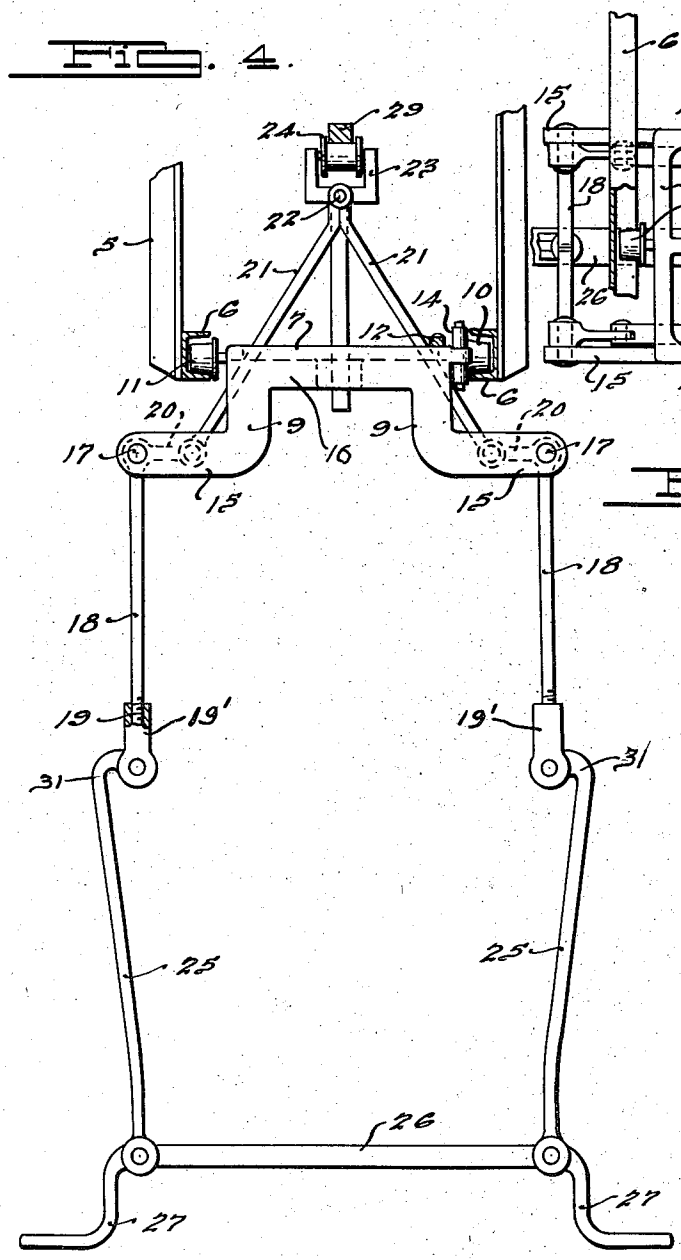
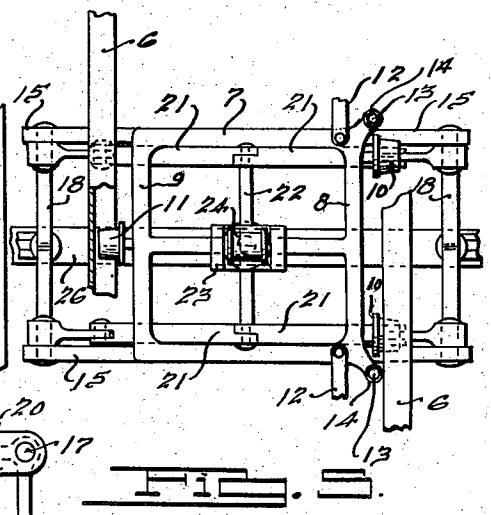


Fig. 5.



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Patented June 6, 1944 2,350,496

UNITED STATES PATENT OFFICE

2,350,496

DIPPING MECHANISM

John V. Davis, Detroit, Mich.

Application August 19, 1942, Serial No. 455,299

14 Claims. (Cl. 214—17)

The present invention pertains to a novel dipping mechanism intended particularly for use in moving the work from bath to bath in a plating process. One of the objects of the invention is to provide such a mechanism that lifts and lowers the work in a straight vertical line. The advantages of such a motion are that it enables economy in the dimensions of the baths and reduces the possibility of the work striking the walls of the baths and the anodes. In this connection it will be noted that an oblique motion of the work lengthwise of the tank causes wastage of tank length, while an oblique motion in the transverse direction would either cause the work to strike the anodes or would require greater tank width.

The direct vertical movement is effected through a system of levers and links suspended from an overhead carrier or travelling support. The mechanism consists essentially of a pair of suspended levers with means for turning them on their axes through a wide arc, preferably 180°. A link is pivotally suspended from the lower end of each such lever, and the lower ends of the links in turn are pivotally attached to a rigid work carrier. When the levers are turned, the links are obviously raised in an arcuate motion, but the rigid member connecting their lower ends can travel only in a strict vertical path. More specifically, the levers are in the form of bell cranks with their upper arms lying horizontally and directed towards each other and joined by a suitable operating linkage. These arms are rotated by means of a suitable actuator applied to the connecting linkage. The 180° swing of the levers brings them above the travelling support which thereby takes the load when the work is in its full elevated position for transfer from one bath to another. At this time, an intermittent propelling device operates on one or more of a series of links connecting the several travelling supports.

Another object of the invention is to dispense with the usual separate propelling chain, and this object is accomplished through the links connecting the travelling carriers.

Another object of the invention is to avoid excessive cramping and spreading of the work while travelling through the bends or turns in an endless tank. To accomplish this object, the track is supported directly above the tank rather than to one side thereof. The work carriers, suspended from travelling supports on the track, lie transversely of the bath. While rounding the turns, the work carriers tend to crowd or cramp at their inner ends and to spread at their outer ends. This tendency is, however, reduced by the mounting of the track directly above the tank such that the turning radius of the carrier, or of the inside rail, is within and smaller than the arc followed by the center of the carrier. This arrangement permits closer spacing of the carriers and reduces the over-all length of the apparatus.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which

Figure 1 is a plan view of the conveying and dipping system;

Figure 2 is a side elevation thereof;

Figure 3 is an elevation in a transverse plane;

Figure 4 is an enlarged elevation of one of the dipping mechanisms, and

Figure 5 is a plan view thereof.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

The several tanks 3 comprised in the plating system are arranged in an endless series, preferably oval shaped in plan for a continuous plating operation.

Over the tanks is supported a correspondingly shaped double-rail track 4 by means of hangers 5. The rails 6 are preferably U-shaped with the open side facing inward. The track carries a series of travelling supports or carriers in the form of rectangular frame members 7 having one side 8 lying along the inner rail and the opposite side 9 at the other rail. At the ends of the side 8 of each carrier, two trolley wheels 10 are mounted on horizontal axes and rest on the inner rail 6. Similarly, another trolley wheel 11 is mounted on a horizontal axis at the side 9 of each frame and rests on the outer rail 6. The side members 8 of adjacent carriers are joined by pivotally attached links 12 to form a connected structure for propulsion, as will presently be described. Vertical pins 13 mounted in the extended sides 8 carry upper and lower guide or bumper rollers 14 adapted to ride against the horizontal sides of the inner rail, especially at the turns. It will be noted that the frame is dropped to provide a lower portion 15 extending below the rails, while the higher portion 16 lies between the rails and carries the rollers 10, 11.

In each side of each carrier 8 (the sides being parallel to the rails), is mounted a double bell crank lever on a horizontal axis 17. The depending side 18 of each lever is Y-shaped, terminating in a stem 19. The horizontal double arms 20 extend horizontally towards the center line of the track.

Pivotally attached links 21 extend upward from the inner ends of the arms 20 and have their upper ends swivelled on a common shaft 22, thereby forming two inverted V's. At about the mid point of the shaft is mounted a yoke 23 carrying a horizontal transverse roller 24 for a purpose that will presently be described.

From the lower end of each stem 19 is pivotally suspended a link 25, and to the lower ends of the links of each pair or unit is pivotally attached a cross member 26 having its ends 27 suitably shaped for the suspension of plating racks 28 or the work itself, in any well known manner.

Slightly above the track 6, 6 and over each partition 2 is provided a transfer rail 29 lying parallel to the center line of the track and adapted to engage the roller 24. The rail is adapted to be pushed down against the roller by any suitable means such as a pair of hydraulic cylinders 30 and is regulated in its upward movement by the same means. There is provided such a transfer rail for each partition 2, and each rail is extended a substantial distance over two adjacent baths 3.

The action of the transfer rail on the bell cranks will now be described. Downward pressure obviously turns the bell cranks on their axes 17. The lower ends of the stems 19 obviously swing outwardly in arcs and, due to the symmetry of the mechanism, the motion of both bell cranks is of equal speed and magnitude. The links 25 are thereby lifted and because of the rigid member 26 pivotally connected to their lower ends, this member can rise only in a straight vertical line. The links 21 are preferably of such length as to permit swinging the bell cranks through an angle of 180°, bringing the arms 18 vertically above the frame 8, whereby the elevated load is supported by the frame or carrier rather than by the hydraulic actuator. In this connection the links 25 are bowed outwardly at 31 to clear the adjacent edges of the carrier 8 and thereby permit the upper vertical position of the links 25.

In its elevated position, the work is ready to be shifted to the next bath. For this purpose, each of the connecting links 12 carries a drive lug 32 adapted to be engaged and pushed by a suitable mechanism. Such mechanism may consist of a hydraulic cylinder 33 in which is a rod 34 with a one-way pawl 35 adapted to engage the lugs successively. The one-way pivotal movement of the pawl 35 permits it to ride over the next rearward lug.

This action is timed to occur while the transfer rail 29 is depressed, and this explains the generous length of the rail. When the work reaches a position over the next bath, the transfer rail is raised and the work thereby lowered. It is desirable, and quite feasible, to control the speed of lifting and lowering the work. For example, buoyant pieces should be lowered slowly in order not to float off the hooks, and hollow pieces should be raised slowly for complete drainage.

The importance of the direct vertical lift and drop, as previously indicated, is to economize on tank length. In other words, the work is transferred at the extremities of adjacent baths whereas, if the motion were only slightly oblique it would begin and end at a corresponding distance on either side of the partition in order to avoid striking the latter, and this distance in the baths would be substantially wasted.

The tank may be provided with two conductors 36 and an intermediate conductor 37 from which the anodes 38 are suspended. The racks 28 are dipped between the anodes as shown. The direct vertical lift and drop assumes further importance in this connection inasmuch as a lateral sway, transversely of the tank, might cause the work to strike the anodes.

The positioning of the travelling carriers 8 around the inside rail 6, rather than within it, causes the work carriers 26 to spread apart slightly while rounding the turns in the track. Consequently the cramping of the work carriers on the turns is reduced, permitting closer spacing of the carriers and reducing the overall length of the tank.

The dipping devices can be accommodated for work of various heights by an adjustment in the length of the stems 19. The adjustment is made, for example, by providing each stem with an end piece 19' threaded thereon and carrying the link 25.

Similarly, the links 12 may be adjustable, or replaceable by links of different length, according to the horizontal dimensions of the work being handled.

Although a specific embodiment of the invention has been disclosed, it may be understood that various changes in the details of the invention may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:

1. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

2. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path, said links being bowed to clear said support when in their upper position.

3. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes through an arc of 180°, whereby to swing said links and raise said cross member in a vertical path to a position where the load is supported upon said supporting member through said levers.

4. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes through an arc of 180°, whereby to swing said links and raise said cross member in a vertical path to a position where the load is supported upon said supporting member through said levers, said links being bowed to clear said support when in their upper position.

5. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally sus-

pended therefrom, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, and means for turning said bell cranks on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

6. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, a linkage connected to the upper free ends of said bell cranks and adapted to swing said bell cranks on their pivotal axes, and means for actuating said linkage, whereby to swing said links and raise said cross member in a vertical path.

7. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom and each having an arm extending horizontally from its pivotal axis, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, and means for turning said arms on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

8. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom and each having an arm extending horizontally from its pivotal axis, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, and means for turning said arms on their pivotal axes through an arc of 180°, whereby to swing said links and raise said cross member in a vertical path to a position where the load is supported upon said supporting member through said levers.

9. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom and each having an arm extending horizontally from its pivotal axis, said arms being directed towards each other, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, and means for turning said arms on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

10. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom and each having an arm extending horizontally from its pivotal axis, said arms being directed towards each other, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, and means for turning said arms on their pivotal axes through an arc of 180°, whereby to swing said links and raise said cross member in a vertical path to a position where the load is supported upon said supporting member through said lever.

11. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, said levers being adjustable in length, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

12. A dipping mechanism comprising a travelling support, a pair of bell cranks pivotally suspended therefrom, a link pivotally suspended from the lower end of each bell crank, a cross member pivotally attached to the lower ends of said links, each bell crank having a depending arm adjustable in length, and means for turning said bell cranks on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

13. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, and means for turning said levers on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path, a guide member extending a distance in the direction of travel and adapted to maintain said turning means in the work-elevating position while said support travels said distance.

14. A dipping mechanism comprising a travelling support, a pair of levers pivotally suspended therefrom, a link pivotally suspended from the lower end of each lever, a cross member pivotally attached to the lower ends of said links, means for regulating the distance between said support and said cross member, and means for turning said levers on their pivotal axes, whereby to swing said links and raise said cross member in a vertical path.

JOHN V. DAVIS.