Oct. 20, 1936. H. S. STARK 2,058,365

ELECTRIC ETCHING APPARATUS

Filed March 16, 1936

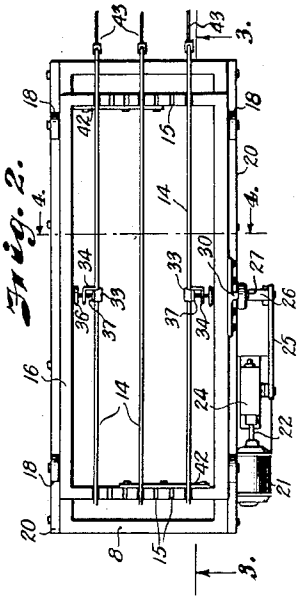


Fig. 2.

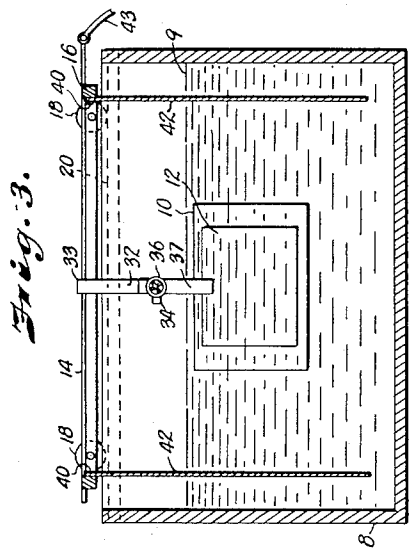


Fig. 3.

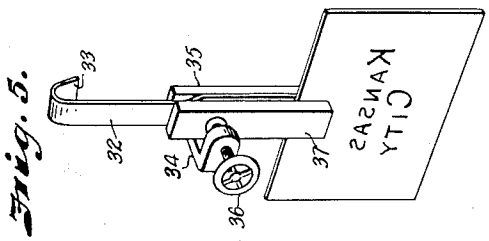


Fig. 5.

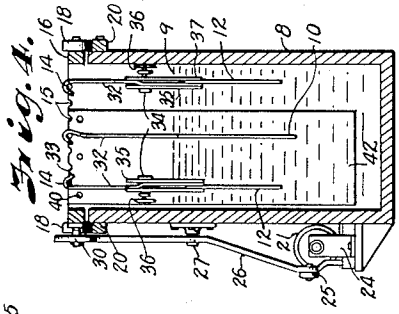


Fig. 4.

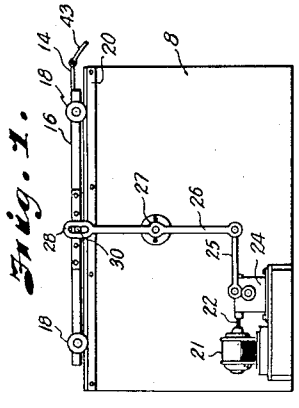


Fig. 1.

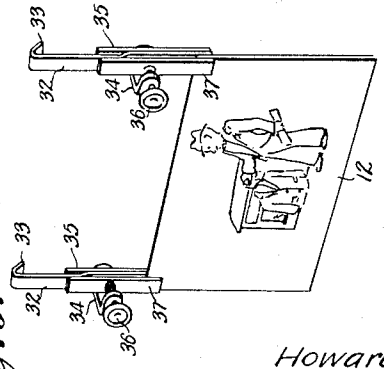


Fig. 6.

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Patented Oct. 20, 1936

2,058,365

UNITED STATES PATENT OFFICE

2,058,365

ELECTRIC ETCHING APPARATUS

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Application March 16, 1936, Serial No. 69,017

5 Claims. (Cl. 204—5)

The present invention relates to etching apparatus, and aims to provide an improved arrangement and construction for producing etchings by electrolytic process.

Accordingly one of the objects of the invention is to provide etching means of this character in which not only any suitable number of plates may be etched by the same operation but the distance between the anode and the cathode members of the apparatus may be conveniently varied for correspondingly varying the speed of the etching process.

It is also an object of the invention to provide a more efficient apparatus for the carrying out of such etching processes, in that the process is effected in such a way as to insure a more even and uniform etching operation, to which end I make provision for subjecting the entire area of the plate being etched uniformly to the effects of the etching process, and in addition there is also provision for a novel agitating action so carried out as to effectively clear both the anode and cathode regions of the products of the electrolytic action resulting from the process.

With the foregoing general objects in view the invention will now be described by reference to the accompanying drawing illustrating suitable and practical equipment for the carrying out of the aforesaid objects, after which those features and combinations deemed to be novel and patentable will be particularly set forth and claimed.

In the drawing:

Figure 1 is a side elevation illustrating an apparatus constructed in accordance with my invention;

Figure 2 is a plan view of the same;

Figure 3 is a vertical sectional view representing a section taken on the line 3—3 of Figure 2;

Figure 4 is a transverse sectional view, representing a section taken on the line 4—4 of Figure 2; and

Figures 5 and 6 are enlarged perspective views of one of the plates and hangers for supporting the same.

Referring to the drawing in detail, the improved apparatus is illustrated as comprising a receptacle or retainer 8 for a suitable electrolytic fluid bath 9 in which are to be submerged the usual cathode plate 10 and one or more anode plates 12. In the present arrangement and construction these plates are supported from suitable conductor rods 14 extending longitudinally of the receptacle 8 and adapted to be variously positioned by the mounting of said rods in any one pair of a series of notches or recesses 15 in the ends of a frame member 16. This frame 16 is mounted for reciprocating movement longitudinally of the receptacle 8 by means of rollers 18 travelling along longitudinal tracks 20 at the opposite sides of said receptacle. The required reciprocatory movement may be produced by means of a suitable motor 21 outside the receptacle, the shaft 22 of which motor operates through a speed changer unit 24 to drive a link 25 connected with a lever 26 fulcrumed at 27 and provided with a slot 28 at its upper end for operatively engaging a pin or lug 30 secured to one side of the frame 16, as clearly illustrated in Figures 1, 2, and 4.

For suspending the anode and cathode plates 10—12 from the rods 14, a series of hanger devices are provided consisting of hanger bars 32 of copper or equivalent conducting material, formed with hook terminals 33 at their upper ends for supporting the same from the rods 14. The cathode plate 10 may be soldered or otherwise permanently attached to its hanger 32; but, in the case of the anode plates 12, each of the hanger bars 32 is provided with a yoke clamping device consisting of a yoke member 34 attached to a block 35 and carrying a clamping screw 36 operating a clamping block 37 for cooperating with the block 35 in clamping, between them, the copper bar 32 in firmly-gripping engagement with the corresponding plate 12.

To the opposite ends of the frame 16 is also secured, as at 40, a pair of agitator plates 42 in depending relation to the same so as to be suspended within the bath of fluid 9, and preferably these plates 42 are carried at opposite sides of the longitudinal center line of the receptacle 8, as represented in Figure 2.

Suitable electric connections 43 of a flexible character are connected with the ends of the conductor rods 14.

With the above described construction it will be apparent that with the method shown for mounting the plates by means of the series of spaced recesses 15, the distance between anode and cathode areas may be appropriately and conveniently varied for correspondingly varying the speed of the etching process, as is sometimes desired in certain cases. In this connection also it is to be noted that the mounting arrangement is such that the entire area or surface of any one plate 12 being etched is maintained at the same distance from the cathode surface, so that the etching action is thereby maintained uniform, to the end that a uniform etching depth is insured for the whole area of the surface being etched. At the same time it is obvious that any

number of plates 12 may be mounted and etched, all at one and the same time.

The hanger construction provides an effective method of not only establishing the required electric connection to the plates but also enabling the same to be suspended in the desired parallel relation as well as to be adjusted any necessary distance apart in the same parallel relation. The removable character of the hanger devices facilitates their mounting and replacement, and where the size or weight of the anode plates renders it necessary two or more of the hanger devices may of course be employed for supporting the plates—as illustrated in Figure 6.

The provision for imparting to the supporting frame a limited reciprocating movement, together with means for agitating the solution, also affords decided advantages. By supporting the plates from this moving frame, the relative position of the plates is unchanged, so that the uniformity of the etching action is also preserved. This reciprocating movement also maintains a wash of the solution across the plate surfaces, and this wash action is of course accentuated by the action of the agitating plates 42, the relative position of which is such as to promote a washing movement parallel to the plate surfaces, or in the most effective direction for keeping the plate 10 free from accumulation of the cathode deposits and for clearing the bubbles tending to collect on the plate 12. The relatively staggered relation of the plates 42 further promotes this washing action in that a continuous washing movement is developed, taking place in opposite directions at opposite sides of the longitudinal center line of the receptacle.

It will therefore be seen that I have devised a practical and efficient arrangement and construction for fulfilling the desired objects of the invention, and while I have illustrated one suitable form of apparatus for embodying the aforesaid improvements I desire to be understood as reserving the right to make whatever changes or modifications may fairly fall within the spirit and scope of the appended claims.

Having described the invention, what I claim and desire to secure by Letters-Patent is:

1. Electric etching apparatus comprising a solution receptacle, hanger devices for suspending the anode and cathode plates within the solution from the top of the receptacle, a reciprocating frame carried by the top of the receptacle and supporting said hanger devices with said plates in parallel relation, and means for reciprocating said frame in a direction parallel to the surfaces of said plates and thereby imparting movement to all said plates in unison and maintaining constant the relation between the anode and cathode plates.

2. Electric etching apparatus comprising a solution receptacle, hanger devices for suspending the anode and cathode plates within the solution from the top of the receptacle, a roller-supported frame mounted for reciprocatory movement on the top of the receptacle and carrying said hanger devices with the plates suspended therefrom in parallel relation, and means for reciprocating said frame in a direction parallel to the surfaces of said plates and thereby imparting movement to all said plates in unison and maintaining a constant anode—cathode relation between the plates.

3. Electric etching apparatus comprising a solution receptacle, hanger devices for suspending the anode and cathode plates within the solution from the top of the receptacle, a reciprocating frame carried by the top of the receptacle and supporting said hanger devices with said plates in parallel relation, agitator plates suspended from said frame within the solution at right angles to the planes of said plates, and means for reciprocating said frame in a direction parallel to the surface of said plates.

4. Electric etching apparatus comprising a solution receptacle, hanger devices for suspending the anode and cathode plates within the solution from the top of the receptacle, a reciprocating frame carried by the top of the receptacle and supporting said hanger devices with said plates in parallel relation, agitator plates suspended from said frame within the solution at right angles to the planes of said plates and on opposite sides of the longitudinal center line of the receptacle, and means for reciprocating said frame in a direction parallel to the surfaces of said plates.

5. Electric etching apparatus comprising a solution receptacle, hanger devices for suspending the anode and cathode plates within the solution from the top of the receptacle, a reciprocating frame carried by the top of the receptacle and provided with a series of recesses at the opposite ends thereof, electric conductor rods carrying said hanger devices and adapted to be adjustably mounted by means of said recesses for supporting the plates in variously spaced and parallel relation, and means for reciprocating said frame in a direction parallel to the surfaces of said plates and thereby imparting movement to all said plates in unison and maintaining a constant anode—cathode relation between the plates.

HOWARD S. STARK.