April 15, 1952 R. F. HAYMS 2,592,693

ETCHING APPARATUS

Filed April 24, 1950 2 SHEETS—SHEET 1

Fig. 1

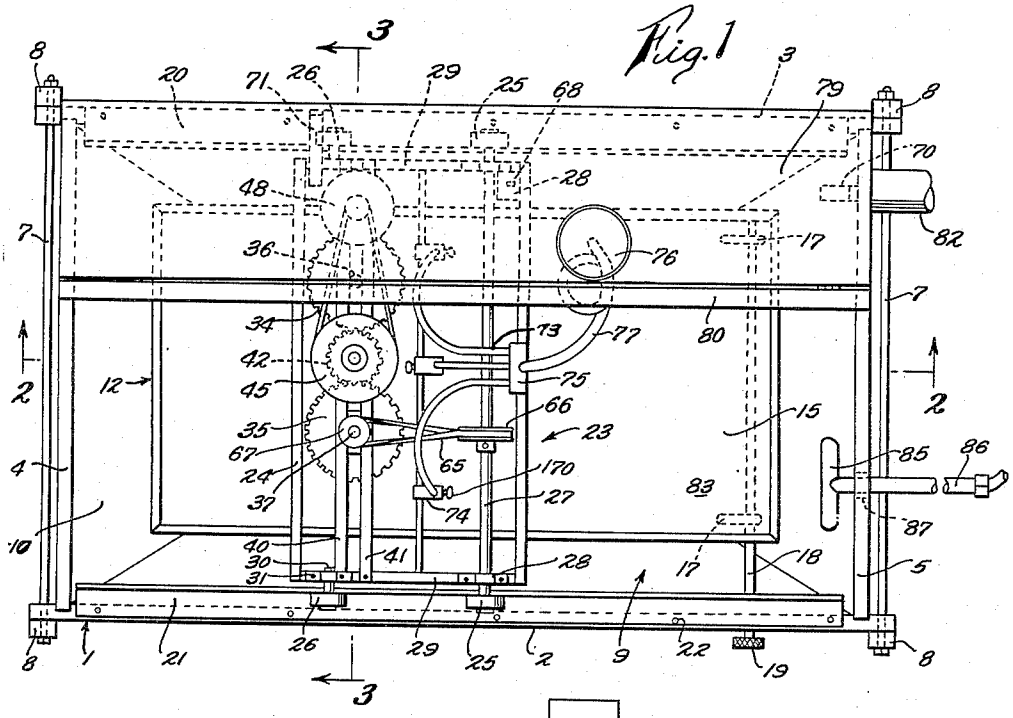
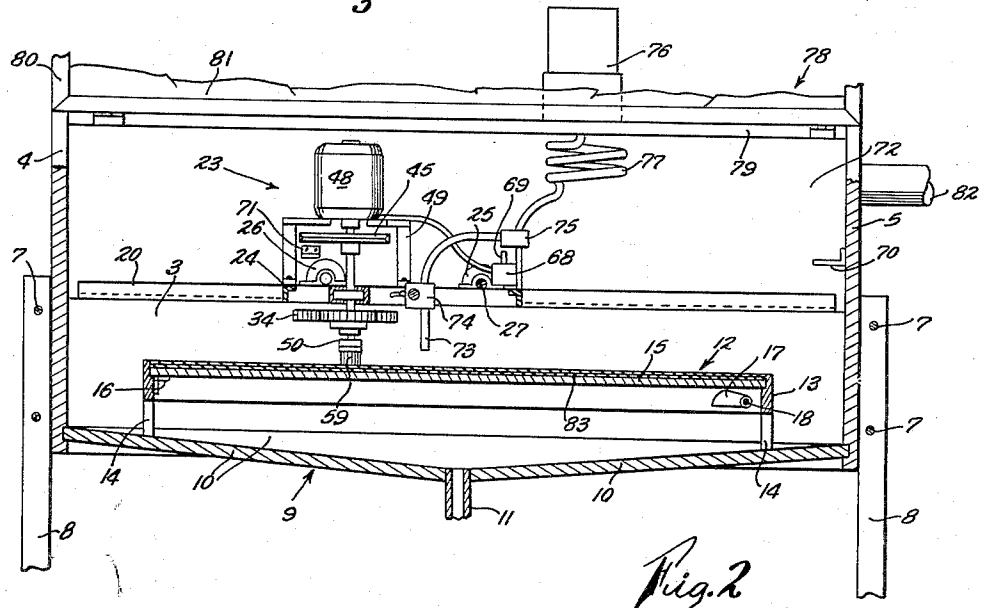


Fig. 2



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Fig. 3

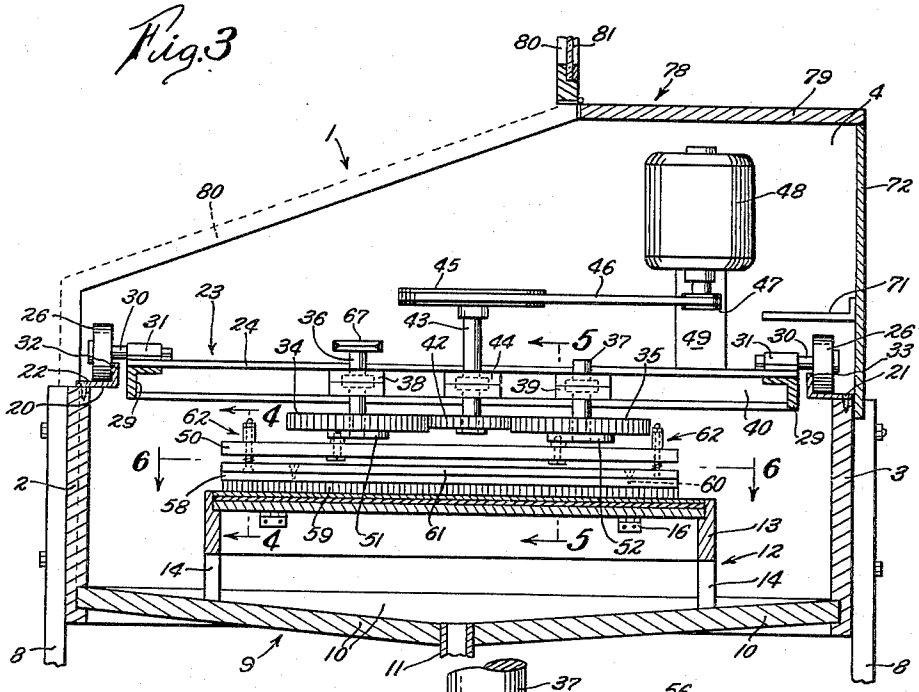
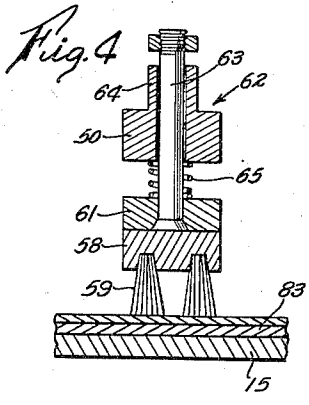


Fig. 4



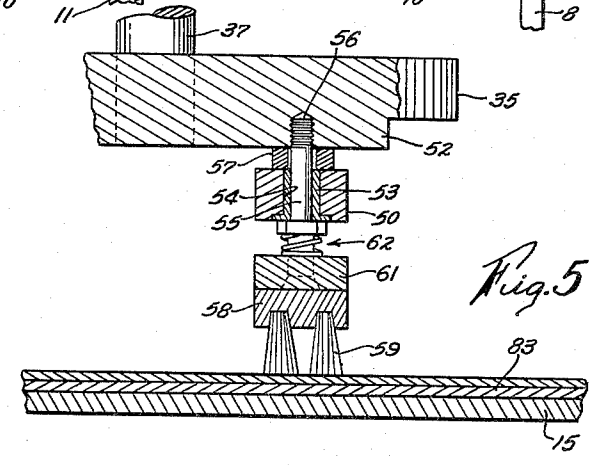


Fig. 5

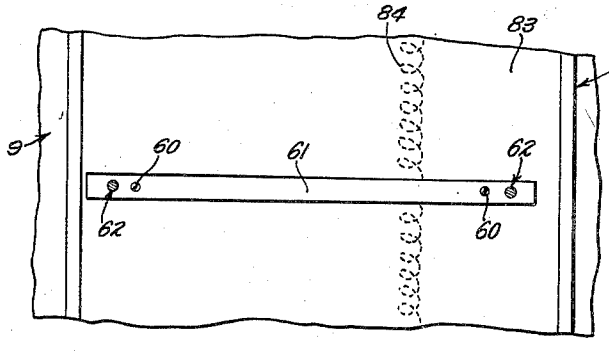


Fig. 6

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UNITED STATES PATENT OFFICE

2,592,693

ETCHING APPARATUS

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Application April 24, 1950, Serial No. 157,811

7 Claims. (Cl. 41—9)

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The present invention relates to developing and etching apparatus and has as its principal object the provision of a device for spreading a mordant or etching fluid upon the coated metal plates used in offset and deep etched lithography, or the like.

Another object of this invention is to provide in etching apparatus of the character described, a mechanical means for reciprocating the etching fluid spreader across the plate to be etched with a continuous, circular action, said apparatus including a means for flowing a controlled volume of etching fluid upon the plate in the path of the spreader during operation of the device.

A further object of the invention is to provide in an etching apparatus having the foregoing characteristics a drain trough for catching spent, etching fluid after said fluid has been spread on the etching plate, the apparatus including a hood and an associated exhauster for carrying off air borne particles and deleterious fumes arising from the surface of the treated plate and the trough.

Other objects of the invention will be apparent from the following specification, reference being had to the accompanying drawings, wherein:

Fig. 1 is a top plan view of the etching apparatus of this invention.

Fig. 2 is a section taken on line 2—2 of Fig. 1, parts thereof being broken away.

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 3.

Fig. 5 is an enlarged section taken on line 5—5 of Fig. 3.

Fig. 6 is a section taken on line 6—6 of Fig. 3.

The etching sink of this invention is shown in the drawings by the reference numeral 1, said sink having opposed side walls 2 and 3 and end walls 4 and 5 secured together in any suitable manner such as by tie rods 7. The tie rods also secure legs 8 to the four corners of the sink in the usual manner. The sink bottom 9 is preferably made of four triangular sections 10 joined along their adjacent edges and inclined downwardly from the respective side and end walls of the sink towards a centrally disposed drain 11. A rectangular etching table 12 is positioned upon the bottom in spaced relation with the side and end walls of the sink and comprises a frame 13 spaced from the bottom 9 by corner legs 14 and carrying a flat work supporting member 15.

As most clearly illustrated in Figs. 2 and 3,

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one end of the work supporting member 15 is hinged at 16 to one end of the frame 13 whilst the other end of the member is supported for vertical movement upon laterally spaced cams 17—17 fixed on an operating shaft 18 mounted between side members of the table frame. One side of the rod extends through the sink side wall 2 and has a control knob 19 secured thereto so that the work support member can be tilted for purposes to be set out hereinafter.

Spaced, elongated rails 20 and 21 are mounted upon the top edges of the sink side walls 2 and 3 respectively, said rails being secured to the sink by wood screws 22, or the like (Fig. 3). A carrier, generally indicated by the numeral 23, is disposed between the rails 20 and 21 and above the etching table 12 for reciprocating movement between limits of motion determined by the end walls 4 and 5 of the sink. This carrier comprises a rectangular frame 24 made from angle irons welded together at the corners, said frame being supported by pairs of wheels 25—25 in tandem which have rolling engagement with, and are guided by, the rails 20 and 21 respectively. The pair of wheels 25 are fixed to the ends of a transverse drive shaft 27 which is journaled in suitable bearings 28—28 mounted upon side members 29—29 of the carrier frame 24. As most clearly illustrated in Fig. 3, the pair of wheels 26 are each fixed to the end of a stub shaft 30 secured to the frame members 29—29 by clamps 31. The carrier frame is guided for reciprocating, back-and-forth movement above the table by means of upwardly extending flanges 32 and 33 formed on the inner ends of the rails 20 and 21 respectively. It is to be noted that the wheels are made of rubber or other resilient and frictional material to cushion any lateral vibration set up in the frame by operation of the brush and also provide a good drive connection between wheels 25 and the rails.

The reciprocating frame carries a pair of laterally spaced spur gears 34 and 35 which are disposed beneath the frame for rotatory movement around the vertical axes of their respective shafts 36 and 37 respectively. As most clearly illustrated in Fig. 3, these shafts are each journaled in bearings 38 and 39 respectively mounted between cross channels 40 and 41 that are fixed at their ends to the frame members 29—29. A drive pinion 42 is disposed between the gears 34 and 35 for meshing engagement therewith, said pinion having a shaft 43 journaled in bearing 44 which in turn is mounted between the cross channels 40 and 41. A pulley

45 is fixed to the upper end of the shaft 43 and is driven by a belt 46 engaging a pulley 47 secured to the drive shaft of a reversing motor 48. The motor is carried by the frame and is suitably mounted thereon by means of brackets 49.

An elongated brush holder 50 is positioned beneath the gears and is preferably made from a solid bar disposed laterally above the table and pivotally mounted on eccentric portions of hubs 51 and 52 for the spur gears 34 and 35 respectively. As illustrated in Fig. 5, the pivotal connection between the bar and each of the gears may comprise a bushing 53 seated in a bore 54 formed vertically through the bar of the brush holder 50, said bushing being adapted to rotatably receive the shank portion of a bolt 55, which is threaded at its upper end in a threaded bore 56 formed eccentrically through the hub of the spur gear. The brush holder may be spaced from the gear hub by a suitable washer 57 interposed between the gear and bar and encircling the shank of the bolt 55. The brush preferably has an elongated unitary head 58 in which the bristles 59 are set, said head being secured by screws 60 to a member 61 which is mounted by vertically extensible end connections 62 to the brush holder 50. Each of these end mountings, as shown in Fig. 4, are adapted to urge the brush 59 toward the table 12, said connection comprising a pin 63 anchored at its lower end in the member 61 and extending upwardly through a sleeve 64 cast in the end of the brush holder 50. A spring 65 encircles the pin and is interposed between the brush holder 50 and the member 61 to urge the brush downwardly upon the table.

The carrier 23 is traversed longitudinally along the sink by a drive connection between the reversing motor 48 and the axle 27 of drive wheel 25. This connection preferably comprises a belt 65 which passes over a pulley 66 fixed to the axle 27 and a pulley 67 secured to the upper end of shaft 36 for the spur gear 34. The motor is reversed when the carriage reaches either limit of its reciprocating motion by means of an electric switch 68 mounted on the frame, said switch having an arm 69 which is engaged by either stop 70 or 71 which are positioned on the side wall 5 and a back wall 72 respectively for the sink.

Means for flowing etching fluid upon the surface of the plate to be etched in the path of the moving brush comprises a plurality of laterally spaced, flexible tubes 73 positioned on the frame by a set of valving blocks 74, said tubes having their discharge ends near the surface of the table 12 and their intermediate portions passing through bores in the blocks. The size of the openings in the bores are each controlled by a set screw 170 threaded in the block and bearing at its inner end on the tube which passes through the bore. By adjusting the set screw the flow of etching fluid through the particular tube can be controlled and metered quantities of the fluid introduced upon the work on the table. All the tubes 73 are connected to a tube header 75 also mounted upon the frame in any suitable manner, the header being connected to a reservoir 76 mounted upon the sink by a flexible and extensible tubing 77.

The open top of the sink is closed by a hood 78 which may be formed by the upper extensions of side walls 4 and 5 which are connected to the back wall 72 and to a narrow top wall 79. An opening is left in the hood which is closed

during operation by door 80 which may have a transparent window 81 therein so that the etching process may be observed therethrough. The fumes created by the process are exhausted through a pipe 82 communicating with the interior of the hood and connected in any suitable manner to an exhauster (not shown).

In operation the usual grounded plate 83 with the drawing cut in the ground is placed upon the work supporting member 15 of the table 12 and the motor 48 energized in any manner. Etching fluid is then introduced into the flexible tubing 77 and from thence flows upon the ground plate through nozzles 73. The brush will be carried back and forth over the plate whilst continuously describing a circular motion whereby the path of every bristle of the brush over the grounded plate will describe a series of connected loops 84 as indicated by the dotted lines in Fig. 6. This brush action effectively spreads the etching fluid over, and into the exposed parts of, the plate to be etched, all excess or neutral parts of the fluid flowing over the edges of the table into the bottom and thence down the drain 11. At the end of the etching period the motor may be stopped when the carrier frame 24 occupies the left-hand side of the sink, as shown in Fig. 1. The table may then be tilted by manual operation of the knob 18 so that a suitable cleaning fluid may be introduced upon the copper plate through the nozzle 85. This nozzle, attached to the end of a hollow handle 86, passes through opening 87 formed through a wall 14 of the sink. The holder is quite long so that the nozzle may be manipulated across the entire table, the cleaning material also flowing from the plate into the sink and thence down through the drain 11 situated centrally of the sink bottom 9.

What is claimed is:

1. In a device of the class described the combination of a sink having a bottom, and side and end walls, an etching table supported upon the bottom and having a work supporting surface spaced inwardly from the said side and end walls, a rail mounted upon each side wall, a carrier disposed between the rails, support wheels mounted on the carrier in rolling engagement with the rails to provide for longitudinal, traversing movement for the carrier above the table, a pair of laterally spaced cranks positioned beneath the carrier and journaled therein for rotatory movement around vertical axes, a transverse brush carried by the cranks and bearing upon the work supporting surface of the etching table, a reversing prime mover on the carrier, a drive connection between at least one wheel, the cranks and the prime mover, a two position prime mover control mounted on the carrier, and a limit stop disposed adjacent each end of the sink and in the path of the control for alternately actuating the control.

2. In a device of the class described the combination of an open-topped sink, a hood mounted upon the sink and extending over the opening in the sink top, an air exhauster connected with the interior of the hood, an elongated rail mounted on each side of the sink within the hood, a carrier disposed between the rails, support wheels mounted on the carrier and having rolling contact with the rails, a pair of laterally spaced gears beneath the carrier and journaled therein for rotary movement around vertical axes, a drive pinion journaled in the carrier for meshing engagement with both gears, an elongated brush holder subjacent the gears, means for pivotally

mounting the holder to an eccentric portion on each of the gears, a motor mounted on the carrier, a drive connection between the motor and the pinion, and a drive connection between the motor and the wheels.

3. In a device of the class described the combination of a sink having bottom, and side and end walls, an etching table supported upon the bottom and having a work supporting surface spaced inwardly from the said side and end walls, a rail mounted upon each side wall, a carrier disposed between the rails, support wheels mounted on the carrier in rolling engagement with the rails to provide for longitudinal, traversing movement for the carrier above the table, a pair of laterally spaced cranks positioned beneath the carrier and journaled therein for rotatory movement around vertical axes, a transverse brush carried by the cranks and bearing upon the work supporting surface of the etching table, a prime mover on the carrier for driving the wheels and rotating the cranks in timed relation, and means on the carrier for flowing etching fluid upon the working surface of the table in the path of brush.

4. In a device of the class described the combination of a sink having a bottom, and side and end walls, an etching table supported upon the bottom and having a work supporting surface spaced inwardly from the said side and end walls, a rail mounted upon each side wall, a carrier disposed between the rails, support wheels mounted on the carrier in rolling engagement with the rails to provide for longitudinal, traversing movement for the carrier above the table, a pair of laterally spaced cranks positioned beneath the carrier and journaled therein for rotatory movement around vertical axes, a transverse bar disposed beneath the carrier, a pivot means for securing the bar to each crank, a holder disposed beneath the bar, a brush secured to the holder, a vertically extensible connection between the ends of the bar and holder, means between the bar and holder for biasing the brush into engagement with the work supporting surface of the table, and a motor

on the carrier for simultaneously driving at least one wheel and rotating the cranks.

5. In a device of the class described the combination of a sink having a centrally disposed etching table, a carrier, means for mounting the carrier on the sink for reciprocating movement above the table, a table engaging brush mounted beneath the carrier for circular movement, means on the carrier for flowing etching fluid on the table in the path of the brush, and a prime mover on the carrier for reciprocating said carrier and for actuating the brush.

6. In a device of the class described the combination of a sink having a raised, centrally located etching table, a carrier, means for mounting the carrier on the sink above the table for longitudinally directed, alternating movement, a narrow brush substantially coextensive with the lateral extension of the table and disposed in bodily contact with the surface of the table, means for mounting the brush on the carrier for circular movement with respect to the said carrier, means on the carrrier for flowing etching fluid upon the table in the path of the brush, and a prime mover on the carrier for reciprocating the carrier and actuating the brush.

7. In an etching device including a sink and a carriage adapted to alternate across the top of said sink, the combination of a lateral brush positioned beneath the carriage in engagement with the work table for the sink, and means on the carrier for mounting the brush therebeneath for circular movement with respect to the carrier.

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