Nov. 16, 1948. W. H. LEGGE 2,454,188

PADDLE MEANS FOR SPRAYING

Filed March 1, 1946 2 Sheets-Sheet 1

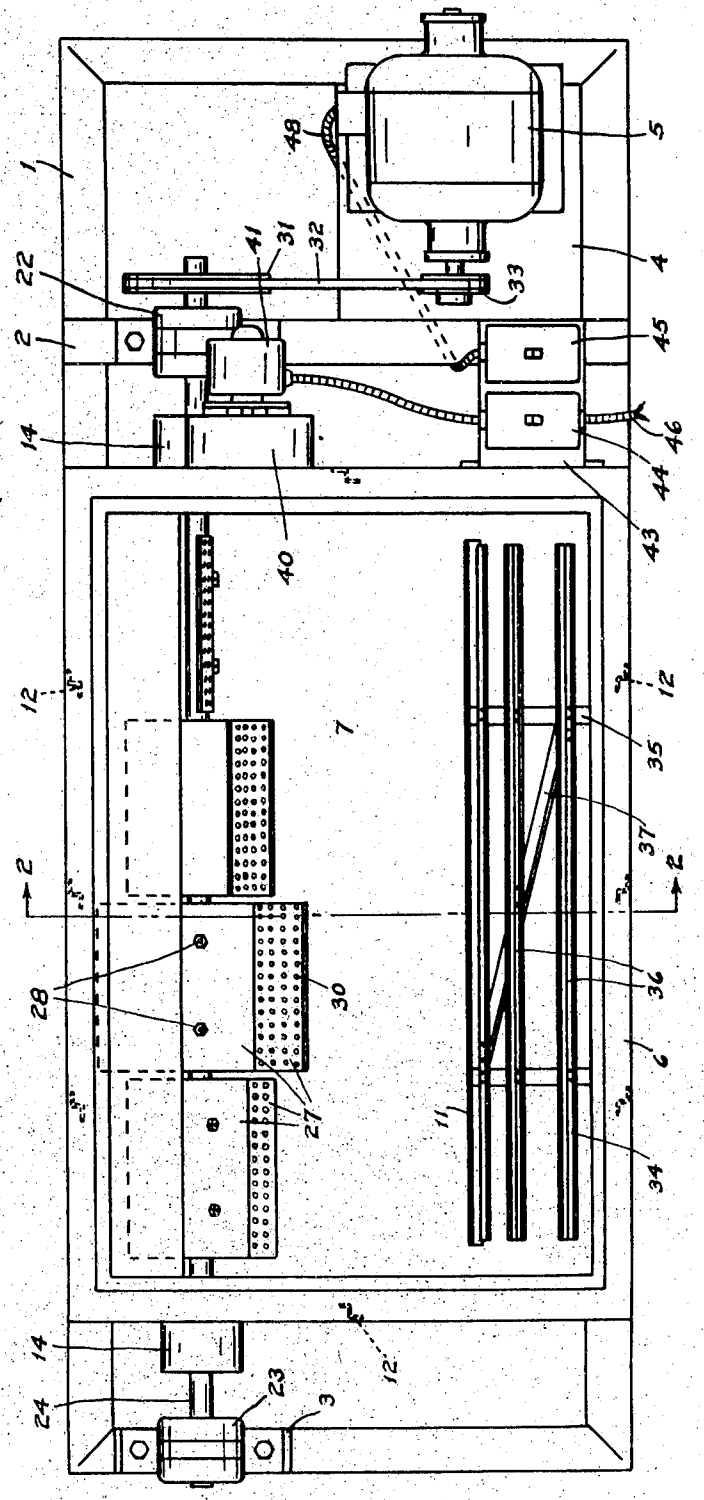


FIG. 1

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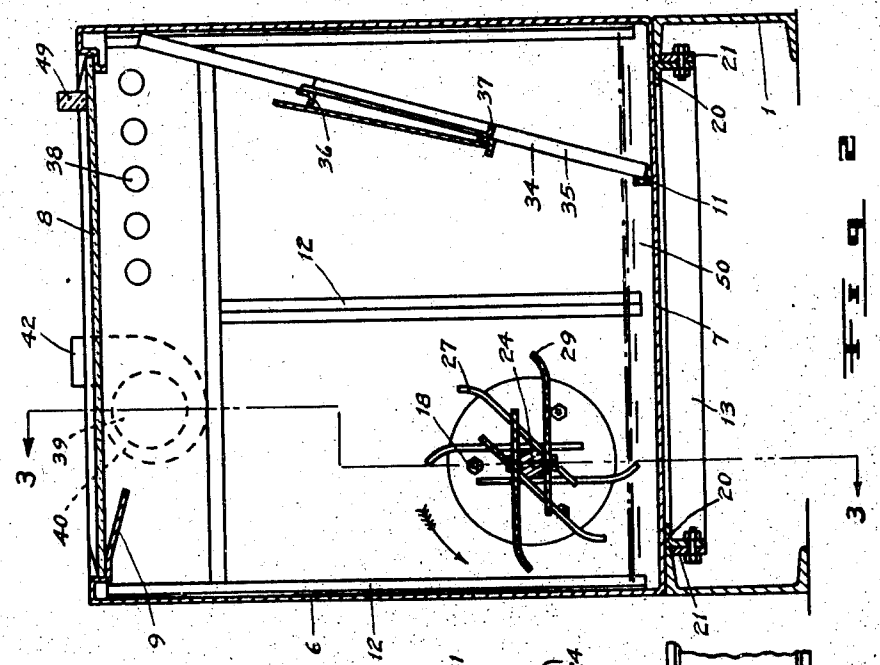


Fig. 2

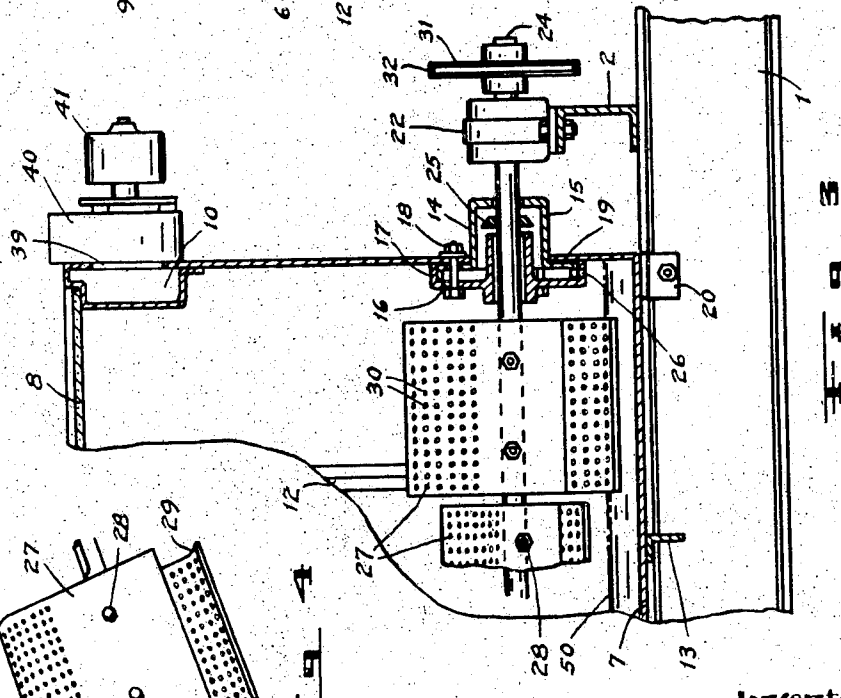


Fig. 3

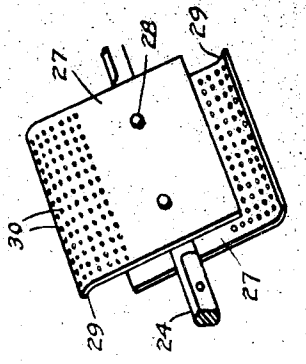


Fig. 4

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PADDLE MEANS FOR SPRAYING

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3 Claims. (Cl. 259—136)

1

The invention relates particularly to machines for etching reproductions on metal for later printing and the principal object of the invention is to produce a machine for the reception of different sizes of plates to be etched, and which will deliver a fine even spray of etching liquid over said plates for a uniform etching operation thereon and completely thereover.

A further object of the invention is to produce a machine of simple design, having a roomy compartment for the etching operation, constructed for visual observation of the process, and for ready accessibility to all parts for cleaning or repair.

A further object of the invention is to design said machine for power operation and for a minimum use of etching fluid in the operation of the same.

A further object of the invention is to design special housings over the drive shaft where it enters the etching chamber, to prevent leakage of etching fluid therefrom.

A still further object of the invention is to remove dangerous fumes from the machine that have been produced in the operation of the same.

With the above important and other minor objects in view which will become more apparent as the description proceeds, the invention consists essentially in the arrangement and construction of parts hereinafter more particularly described, reference being had to the accompanying drawings in which:

Figure 1 is a plan view of the machine with the transparent cover plate removed.

Figure 2 is a cross section through the machine taken on the line 2—2, Figure 1.

Figure 3 is a sectional view taken on the line 3—3, Figure 2.

Figure 4 is a perspective view of part of the paddle shaft and showing a pair of paddles in position thereon.

In the drawings, like characters of reference indicate corresponding parts in the several figures.

A rectangular shaped channel frame is indicated by the reference numeral 1 and a cross channel member 2 is supported thereon toward one end thereof. A short piece of channel 3 is fastened on the opposite end of the frame. A plate 4 is positioned on one corner of the frame, welded thereto and a third side is received under the channel 2 and welded thereto to provide a platform for an electric motor 5.

The etching chamber comprises a rectangular

2

shaped casing 6, having a bottom 7 and an open top. The upper edges of the sides are bent inward in a U and Z shape to form a sunken ledge for the reception of a transparent cover plate 8, formed from suitable plastic material such as "Lucite" and suitably reinforced with ribs to prevent bending. This cover plate is removable. On one side, the ledge is extended and bent down at an angle to form a drip plate 9, and at the motor end, the material from the ledge is continued downward and then carried back to the side to form a chamber or passage 10 thereacross for a purpose later described. An angle plate 11 passes lengthwise along the bottom of the tank and slightly to one side of the centre thereof and is welded thereto. The reason for this plate will be described later. On the sides and ends of the casing 6, reinforcing plates 12, of a Z shape, are suitably fastened, and a pair of angles 13 pass centrally under the bottom of the casing for further reinforcement. All interior plates are preferably made from stainless steel.

On each end wall of the casing 6, a short distance up from the bottom and toward the side away from the angle plate 11, a special leak proof housing 14 is provided. These housings comprise a cup shaped member 15 and a bearing shaped member 16, both having outer flanges but the flange 17 of the bearing shaped member encircles the flange of the cup shaped member. The centre of the cup shaped member is pressed outwardly through an opening in the end wall of the casing 6 and three bolts 18 pass through the flanges of the members to fasten them to the end wall, suitable gaskets 19 being provided.

The casing 6 is placed on the frame 1 and is bolted thereto at each corner and at the centre through angle brackets 20 welded to the bottom of the casing and plates 21, welded to the frame. A bearing 22 is fastened to the cross member 2 and a further bearing 23 is fastened to the piece of channel 3, and both are aligned with the housings 14 on the casing 6. These two bearings rotatably receive a shaft 24 which passes through the leak proof housings 14 and across the interior length of the casing 6. The central holes in the housings are larger than the diameter of the shaft and care should be taken to insure that the shaft is centered therein as any contact of the shaft with the housing members will result in vibration and noise. Between the members 15 and 16 in each housing, the shaft 24 is provided with a tapered collar 25 which is pressed

onto the shaft and when rotating therewith, throws off by centrifugal force, any liquid which passes through the bearing shaped member 16. The liquid so thrown off, is received by the walls of the cup shaped member 15 and then drains back into the casing through a hole 26 drilled through the flanges of the members 15 and 16.

Within the casing 6 and between the leak proof housing 14, the shaft 24 is milled flat on opposite sides and in four different places, and at each place, the milling is in a plane 45° out of line with the next set of milled faces. These milled faces receive a pair of paddles 27, best shown in Figure 4, and each pair of paddles are fastened to the shaft with a pair of bolts 28. The paddles comprise flat rectangular plates having one end curved, as at 29, and they are placed on the shaft slightly off centre so that the curved end of one projects past and over the flat end of the other, with a space or pocket, the width of the milled shaft therebetween. The curved ends of the plates for some distance back are also provided with a series of holes 30 therethrough giving a colander effect to that end. As the milled faces are 45° out of alignment with each other, the sets of paddles are also out of alignment this amount and with four sets of paddles, they encircle the shaft so that a curved end of a paddle is always projecting from the shaft every 45°. A V-belt pulley 31 is connected to the end of the shaft and is driven through a belt 32 by a pulley 33 on the shaft of the motor 5. When the motor is started, the paddles are rotated, and in the direction of the applied arrow in Figure 2.

A supporting rack 34 is provided to support the plates to be etched. This comprises a pair of vertical angle members 35, connected to three cross angle members 36, positioned at different places therealong. A further reinforcing angle 37 passes diagonally across the back of the rack and is suitably fastened to the members. The rack is positioned in the casing 6 with the vertical angles resting on and welded to the lengthwise angle plate 11 at the bottom of the casing, while the upper ends of the vertical angles are welded to the wall of the casing. The plate to be etched is placed on one of the cross angle members 36 with the upper end leaning against the next higher cross member, as shown in dotted outline in Figure 2.

The side of the chamber 10, facing the interior of the chamber 6, is provided with a series of holes 38 and the wall of the casing 6, where it also forms the wall of the chamber, is provided with an opening 39 which connects with the interior of a fan casing 40, the fan of which is driven by a motor 41, carried thereby. When the motor is operated, vapor fumes are drawn from the casing 6, through the holes 38 and opening 39 and delivered out a pipe (not shown) connected to the fan casing outlet 42.

A shelf bracket 43 is exteriorly carried by one end of the casing 6 and this supports a pair of electric contact switches 44 and 45 which are connected to main electric wires in the cable 46. The switch 44, through the wires in the cable 47, control the fan motor 41 and the switch 45, through the wires in the cable 48, control the motor 5.

In operation, the operator lifts the cover plate 8 of the etching chamber by grasping the attached handle 49. A 15% to 25% Baumé solution of nitric acid 50 is poured into the chamber, sufficient to just cover the curved end of the bottom paddle 27. The plate to be etched, usually zinc, is then placed on the rack with the side

to be etched facing the paddles 27. It might be mentioned here that the reproduction to be etched is printed on the plate before insertion in the etching chamber, usually by a photographic process. The cover plate is then closed and the motor 5 is started.

The curved ends of the rotating paddles pick up the solution as they pass therethrough, and it runs over the lower surface of the paddles into the pockets between the paddles and builds up a pressure therein. The air pressure against the rotating paddles, plus the built up pressure, forces a large amount of the solution through the perforations like a rain and the centrifugal force of the whirling paddles whip this rain outward in a fine driving spray. As the paddles are staggered at 45° intervals across the etching chamber, this spray leaves the paddles in what might be termed, spiral streams, which completely and evenly impinge or wash across the plate to be etched and then runs back to the bottom of the etching chamber. This spiral action of the paddles also balances the shaft and creates a steady load on the motor during the operation.

The solution thus evenly thrown on the plate, attacks the metal of the plate where it is unprotected by printing and the chemical action so produced, eats away the plate at such places while the continuing spray of solution washes away the resulting residue for further chemical action by the acid. Accordingly, the longer the plate is exposed to the action described, the deeper the etching will be. To protect the plate against the acid attacking the metal under the printing, the plate may be removed from time to time during the process, washed, wiped and then dusted with a powder, and then replaced in the etching chamber. This powder adheres to the etched walls and resists the action of the acid thereon while the force of the spray removes the powder from the bottom so that the chemical action continues on this area. When the required depth of etch is obtained, the plate is removed, washed and dried, and is then ready for printing or the production of mats for the same purpose.

At any time during the above operation, or before removing the cover plate, the operator may start the motor 41 and the fumes produced in the etching chamber by the operation, will be removed and will not be inhaled by the operator while removing the plate or inspecting the work.

From the above, it will be apparent that I have produced a simple and efficient machine which will be easy to keep in repair. It will receive plates of many varying sizes and will uniformly etch them all due to the fine even spray produced and the method used to pass this spray over the plates. Being power equipped, work can be done continuously and in quantity while the operator at all times has perfect visual observation of the working of the machine to insure correct operation. Due to the method of picking up the solution, only a small amount of said solution is required in the chamber. The solution never leaves the chamber and no leakage occurs through the housings so none is lost, other than that used up in the chemical action on the plates, and this leak prevention also keeps the outside of the etching chamber clean in appearance. The fan system of removing fumes insures the health of the operator and permits ready inspection of the work or its removal in perfect comfort. The casing 6 and interior parts, all being made from stainless steel, will last indefinitely.

What I claim as my invention is:

1. A paddle wheel for spraying or surface stirring of liquids, comprising: a shaft rotatably suppported; a pair of paddles mounted on said shaft; said paddles positioned parallel across said shaft, one on each side, to form pockets therebetween, and each paddle mounted oppositely off center; perforations through the faces of the projecting ends of said paddles; and means for driving said shaft.

2. Paddle means for spraying or surface stirring of liquids, comprising: a shaft rotatably supported; pair series of paddles mounted on said shaft in spiral formation therealong; each pair of paddles positioned parallel across said shaft, one on each side, to form pockets therebetween, and each paddle mounted oppositely off center; perforations through the faces of the projecting ends of said paddles; and means for driving said shaft.

3. Paddle means for spraying or surface stirring of liquid in a container, comprising; a shaft

rotatably supported and passing through said container; pair series of paddles mounted on said shaft within said container and in spiral formation therealong; each pair of paddles positioned parallel across said shaft, one on each side, to form pockets therebetween, and each paddle mounted oppositely off center; the projecting end of each paddle curved inward toward the opposite parallel paddle; perforations through the faces of the projecting ends of said paddles; and means for driving said shaft.

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