

Nov. 19, 1935.

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2,021,485

APPARATUS FOR AND PROCESS OF COATING PLATES

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2 Sheets-Sheet 1

Fig. 1

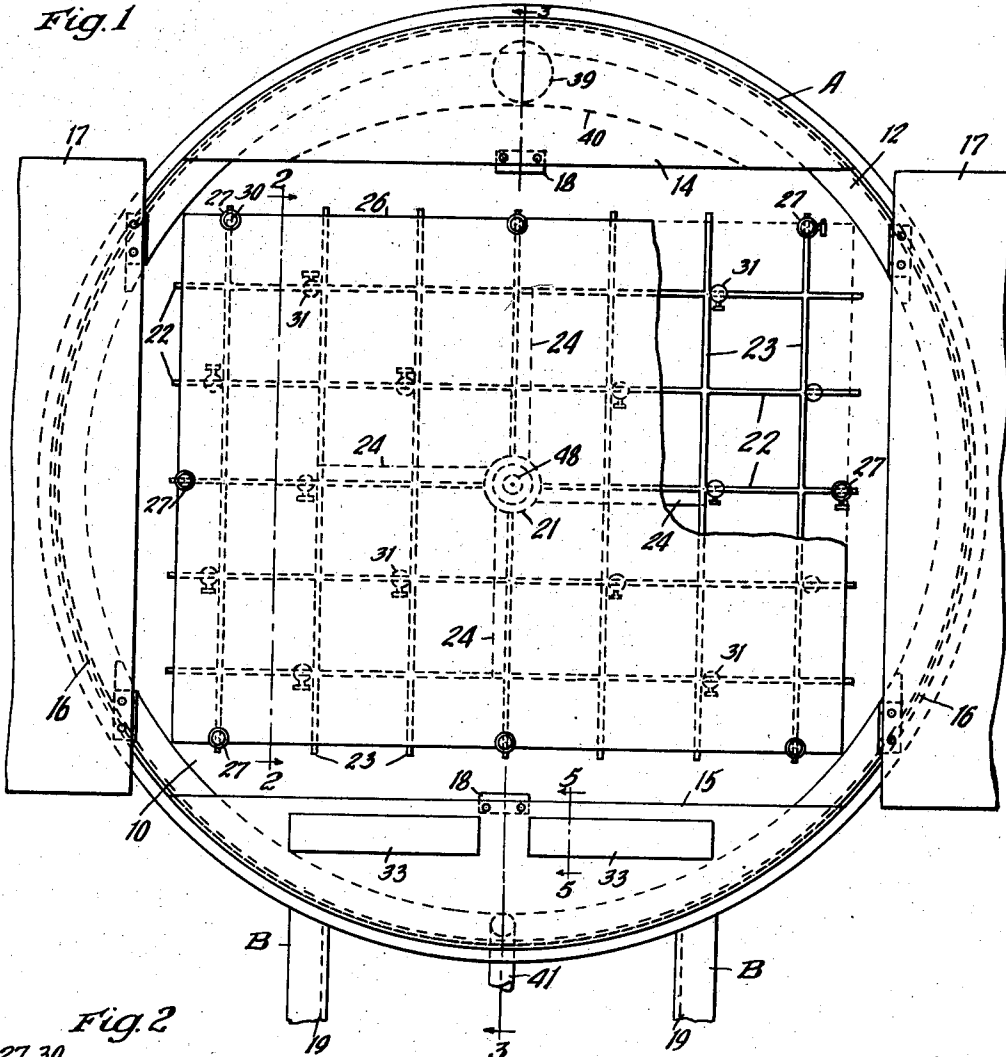
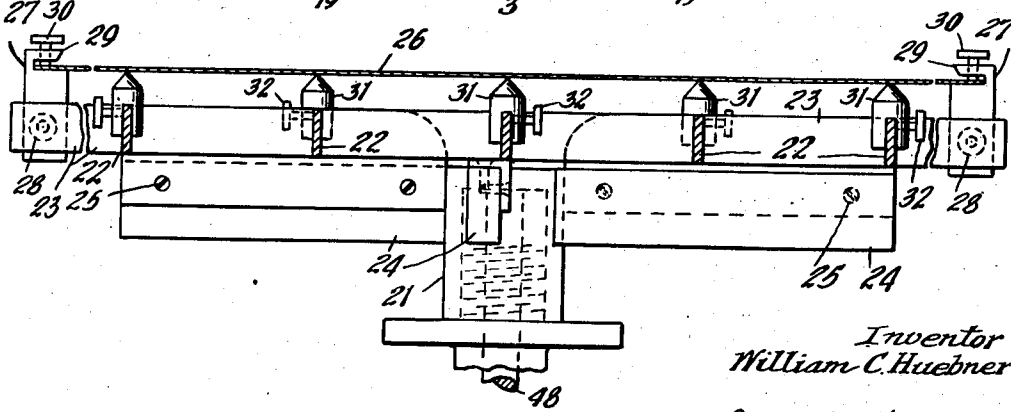


Fig. 2



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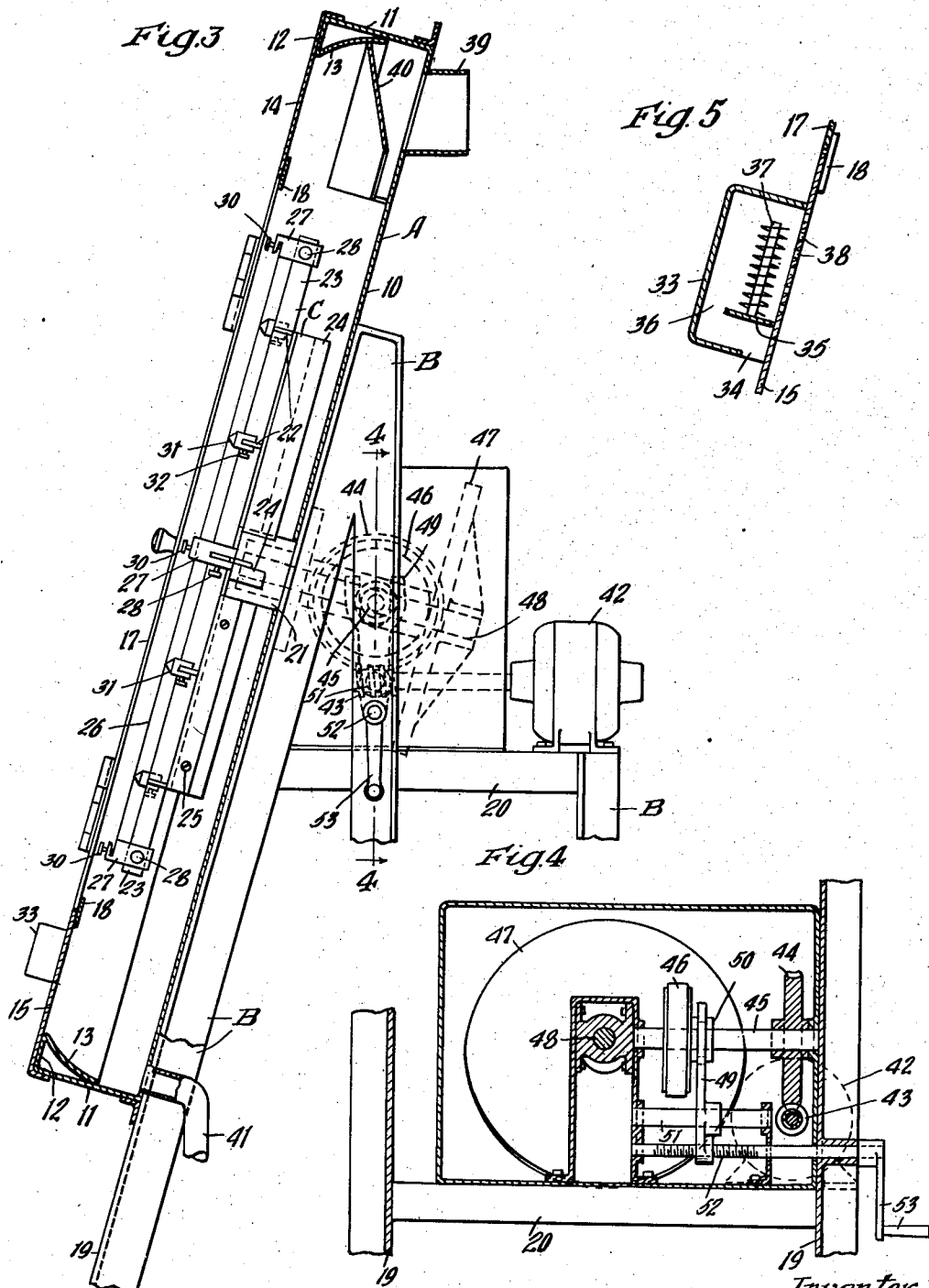
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APPARATUS FOR AND PROCESS OF
COATING PLATES

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5 Claims. (Cl. 91—42)

This invention relates to improvements in apparatus for and process of coating plates.

In the preparation of press plates for photographic or photo-composing machines, one of the difficult problems has always been the application of the light sensitive or other coatings thereto in an absolutely uniform and perfectly smooth manner. The plates, generally of zinc, aluminum or the like, are of comparatively large size which necessitates application of the coating material rapidly over the entire surface before the coating material has any opportunity to harden or dry out at any one spot sooner than at any other spot.

Heretofore, the customary method of coating such plates has been by means of what is known as a "whirler". The ordinary form of whirler comprises a large, comparatively shallow, horizontally disposed open top tank with a supporting table disposed therein, the table being rotated at high speed in a horizontal plane by means of a vertically disposed shaft to which secured. The press plate is secured on the table with that side up which is to be coated and, as the table with the plate thereon is rotated, the coating material is poured onto the plate. Due to the rapid rotation, the coating material, which is applied in liquid condition, is gradually spread outwardly over the surface of the plate under centrifugal action.

Whirlers of the type described and the process involved therein for spreading the coating material are open to several objections. Because of their large size, considered horizontally, a great deal of floor space is required which is seriously objected to by users. It is also more or less difficult for the user to reach over to the central areas of the plate when pouring on the coating material with the result that he does not pour the material on in uniform manner. Another serious difficulty is due to the fact that, as experience has shown, the coating material does not spread uniformly under the single action of centrifugal force. At or near the center of rotation, the centrifugal force is obviously much less effective than at points removed from the center of rotation with the result that the coating flows less readily and tends to leave a thicker layer near the center of rotation than in the peripheral areas. This tendency or lack of even or uniform flow is further accentuated in the event the plate contains any slight unevenness or waves therein.

One object of this invention is to provide a plate coating machine which will be free of the objections to former coating machines and which

will occupy a minimum of floor space; be so arranged as to provide easy access to all portions of the plate while the coating material is being applied thereto; and which will insure a more rapid and uniform spreading of the coating material over the entire area of the plate than heretofore.

Another object of the invention is to provide an improved process of applying coating materials to plates, such as large press plates, wherein the action of gravity is so combined with centrifugal action as to not only insure a perfectly uniform and even application of the coating material over all portions of the plates, but also shorten the time required.

Other and more specific objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a front elevational view of a coating machine embodying the invention and suitable for carrying out the improved process, the doors of the tank or container being open and partly broken away and a portion of a plate on the table being also broken away to better illustrate certain features of construction. Figure 2 is a sectional view corresponding to the line 2—2 of Figure 1 upon a somewhat enlarged scale. Figure 3 is a vertical sectional view corresponding substantially to the line 3—3 of Figure 1 and upon an enlarged scale. Figures 4 is a vertical sectional view corresponding to the line 4—4 of Figure 3. And Figure 5 is a detailed sectional view corresponding to the line 5—5 of Figure 1.

In said drawings, the improved coating apparatus comprises, broadly, a tank or container A; suitable standards or support B therefor; a rotatable table C; a variable speed driving mechanism hereinafter described.

The tank or container A will be made of sufficient size to accommodate the maximum size press plate intended to be coated therein and will approximate several feet in diameter in the preferred form. Said tank may be made in any suitable manner and shape but preferably is composed of sheet metal and of generally circular form having a back wall 10 and a circular periphery or side wall 11. For rigidity and also to act as a deflecting member, the circular wall 11 is preferably folded back upon itself at its outer edge so as to form an outer flat flange 12 and an inwardly extending concaved flange 13, said formation extending around the entire periphery. At the top and bottom, segmental plates 14 and 15 are employed and similar but smaller segmen-

tal side plates 16—16. The inner edges of the segmental plates 14 and 15 and 16 define an approximately rectangular opening which is adapted to be closed by a pair of hingedly mounted doors 17—17, suitable stops 18—18 for the doors being secured to the top and bottom front plates 14 and 15 to limit the closing movement of the doors.

The tank or container as clearly shown in Figure 3, is supported in a non-horizontal position and preferably at a comparatively large angle to the horizontal. In the drawings, the tank is shown inclined at an angle of approximately 75° to the horizontal which, in actual practice, has been found to give satisfactory results. The tank is mounted on the standard B which preferably consists of two triangular shaped supports 19—19 of angular cross section, suitably laterally spaced and having the inclined legs thereof riveted or spot welded to the back wall 10 of the tank. An additional support for the driving mechanism, hereinafter described, is also provided as indicated at 20.

The rotatable table C may be of any suitable construction consistent with its free rotation within the shallow tank A. As shown, the table C comprises a hub 21 to which is secured the table proper, the latter being of preferably grid formation, consisting of horizontally extending bars 22—22 and vertically extending connecting and bracing bars 23—23. The grid table formation is rigidly secured to a plurality of radially extending arms 24 integral or otherwise rigid with the hub 21 so that, upon rotation of the latter, the table proper will obviously be similarly and simultaneously rotated. To allow of interchange of the grid tables proper, the latter are preferably detachably secured to the radial arms 24 as by means of the screws 25—25.

To hold a sheet metal press plate, such as indicated at 26 taut and true on the rotatable table, a plurality of adjustable clamps 27—27 are provided, slidable on the bars of the grid and adapted to be secured in any adjusted position by set screws 28—28. Each of said clamps has a suitable clamping jaw 29 and clamping screw for the edge of the plate as indicated at 30. Additional means for supporting the plate at different points within its periphery are provided in the form of a series of adjustably mounted cone plate supports 31—31 slidably adjustable on the several bars of the grid table and likewise adapted to be secured in any adjusted position by set screws 32. In this manner, it is evident that press plates of different sizes can be readily clamped in fully taut position and supported at a sufficient number of points so as to eliminate waves or bulges in the plate at any point thereof.

When the doors of the tank are closed, it is obvious that the tank provides a closed chamber within which the table and plate secured thereto are rotatable in a plane corresponding to the inclination of the tank. In carrying out the process, it is desirable to circulate a current of heated air through the chamber to accelerate the drying of the coating material, as hereinafter described. For this purpose, the tank is provided at the bottom thereof with preferably a pair of special air admission arrangements shown in detail in Figure 5. Each of said arrangements comprises a sheet metal hood 33 secured to the plate 15, said hood having an elongated slot admission opening 34 on the bottom side thereof and above the latter and within the chamber formed by the hood 33, a baffle plate 35 so that air admitted is

compelled to pass through the opening 36 between the baffle 35 and front wall of the hood. In the chamber formed above the baffle plate 35, are employed any suitable, preferably electrical, heating means, one such means being indicated conventionally at 37. The air after passing the heating elements is then admitted to the interior of the tank chamber, through suitable perforations or inlet ports 38—38 made in the plate 35, thus providing for an incoming current of heated air near the bottom of the tank chamber. The air is exhausted at the top of the tank through the outlet port 39, which preferably will communicate with an exhaust fan so as to insure positive air circulation.

With the arrangement shown and described, it is apparent that the current of heated air in passing from the inlet to the outlet port, circulates in contact with both surfaces of the plate.

Referring to Figure 3, it will be noted that at the top of the tank on the interior is provided a baffle or drip plate 40 of substantially arcuate form so as to prevent any thrown off coating material from entering and clogging the outlet port 39. At the bottom, the tank is provided with a drain pipe 41 for such of the coating material as is thrown off, as will be understood.

In actual practice, it is desirable that the plate holding table be rotated at different speeds both for different size plates and for different kinds of coating material. The driving mechanism for this purpose shown, comprises, broadly, a suitable electric motor 42 mounted on the support 20; a worm 43 on the armature shaft of the motor; a worm gear 44 cooperable with the worm 43; a driving shaft 45 driven by the worm gear 44; a friction driving wheel 46 slidably keyed to the shaft 45; and a friction driving disc 47 carried by the shaft 48, which in turn is rigidly associated with the table hub 21. As will be apparent, when the shaft 45 is driven, the friction wheel 46 will engage with and rotate the friction disc 47 and hence, the table and plate secured thereto. To vary the speed, the friction driving wheel 46 is movable inwardly and outwardly radially of the disc 47 by means of a suitable shipper yoke 49 engaging a grooved collar 50 carried by the friction wheel 46, the yoke 49 being slidably mounted on a fixed support 51 and having threaded engagement with an adjusting screw 52, which carries an operating handle 53 at its outer end. Obviously, by rotating the screw 52, the friction wheel 46 is moved inwardly and outwardly correspondingly and thereby the desired speed of the table effected.

When the plate has been mounted on the supporting table, the latter is rotated at the desired speed in a plane approximately 75° to the horizontal, thus effecting simultaneous rotation of the plate as will be understood. In applying the coating material, the doors 17 will be swung open and the operator will stand facing the rotating table and plate. The coating material, in liquid condition, is then fed or poured onto the plate by the operator, as through a suitable tube or pipe. The material will be initially poured on as near the center of rotation as possible and the operator will gradually lower the supply tube, that is, move the point of application of the coating material away from the center of rotation outwardly toward the periphery of the rotating plate and toward the bottom thereof. As the coating material strikes the inclined surface of the rotating plate, it is simultaneously acted upon by two forces, namely, gravity which tends to flow the

material downwardly, as will be understood, and centrifugal force which tends to flow the material in gradually expanding circles concentric with the center of rotation. Where the coating material strikes the rotating plate at or adjacent the center of rotation, the centrifugal force is comparatively small but, due to the relatively slow rotational speed of these portions of the plate adjacent the center of rotation, the force of gravity has its maximum effectiveness in tending to pull the coating material downwardly. At points more radially remote from the center of rotation, the centrifugal force is progressively greater whereas, due to the progressively greater rotational speed of the surface points farther from the center of rotation, the time interval for action of gravity tending to flow the material downwardly is correspondingly lessened. Stated otherwise, the forces of gravity and centrifugal action always tend to compensate each other, that is, as the effectiveness of the one force increases, the effectiveness of the other decreases and vice versa. Due to these combined forces and balancing effects, experience has shown that the coating material will not only be spread over the entire area of the plate in a very rapid manner, but with practically absolute uniformity and evenness and without the formation of any ridges or ripples such as occur in those whirlers employing centrifugal action only. By reason of the more rapid spreading of the coating over the area of the plate, all danger of the coating setting or thickening in isolated areas is eliminated and the whole operation of pouring on the material is considerably shortened. It is also evident that, due to the position of the plate rotating in a nearly vertical plane, the operator can work over any desired portion of the plate without any excessive reaching or difficulty.

After the coating material has been spread over the plate as above described, the doors are closed and the hot air passed through the chamber, the table and plate being continued in rotation until the drying or setting action is completed. In actual practice, the pouring on of the coating material can be accomplished in a very few seconds and the drying period may be carried on for approximately eight minutes when using average coating materials. In the event of any minute waves being present in the plate that are not entirely removed when clamped in position on the table, the combined gravitational and centrifugal forces acting on the liquid coating material will still be effective over any such wavy area, regardless of the direction in which the wave may extend since, if the wave is so positioned as to tend to block the action of gravity, nevertheless the centrifugal force will be effective thereover and vice versa. It will be understood, of course, that any such waves in the plate, if present at all, will be extremely minute or shallow.

As will be understood by those skilled in the art, a certain amount of the coating material may be thrown off of the plate while the latter is rotating. Such material will generally strike the curved flange 13 but in any event all of the same will gravitate to the bottom of the tank and be drained out through the pipe 41.

Although what is now considered the preferred manner of carrying out the invention has been shown and described, the same is merely illustrative and all changes and modifications are contemplated that come within the scope of the claims appended hereto.

What is claimed is:

1. The herein described process of coating a printing plate with a sensitized coating which includes: rotating a plate in a plane disposed at a relatively small angle to the vertical; pouring the coating material in liquid condition onto the upper inclined surface of the plate while rotating; and spreading the coating material over the plate surface from the center of rotation outwardly to the periphery by the combined effects of gravity due to the inclined position of the plate and centrifugal force due to the rotation of the plate.

2. The herein described process of coating a plate which includes: rotating the plate in a plane disposed at an angle to the horizontal and while within a chamber adapted to confine a current of air therethrough in a path contacting with the surfaces of the plate; pouring the coating material in liquid condition onto the surface of the plate while rotating; spreading the coating material over the surface of the plate from the center outwardly to the periphery by the combined effects of gravity and centrifugal force; and accelerating the setting of the coating material by passing a current of air in contact with the surfaces of the plate through the chamber while closed.

3. The herein described process of coating a plate which includes: rotating the plate in a plane disposed at an angle to the horizontal while within a chamber; pouring the coating material in liquid condition onto the surface of the plate initially adjacent the center of rotation and then gradually outwardly therefrom while the plate is rotating; spreading the coating material uniformly over the surface of the plate by the combined effects of gravity and centrifugal force; and accelerating the setting of the coating material by passing a current of heated air through the chamber in contact with the plate while the chamber is closed.

4. In a machine for coating a flat plate with a sensitized film, the combination with a tank of general cylindrical form of relatively large diameter and shallow depth, said tank being inclined at a relatively small angle to the vertical; of a supporting table having means for clamping the plate taut thereon and rotatable within the tank in a plane parallel to the general plane of the tank; door closure means for the tank on its upper inclined face, said closure means, when open, permitting ready access to the entire upper surface of the plate to permit pouring of the film solution thereon from the center outwardly to the rim of the plate; and means for admitting a heated current of air to the tank adjacent one edge of the plate and withdrawing the air from the tank at a point substantially diametrically opposite the point of admission whereby, when said door closure means are closed and the plate with the solution thereon rotated within the tank, the heated current of air is positively forced to move in paths substantially parallel with and over and in contact with both surfaces of the plate to uniformly accelerate the setting and drying of the film solution thereon over the entire surface.

5. In a machine for coating a plate such as a press plate with a sensitized film, the combination with a tank of generally cylindrical form of relatively large diameter and shallow depth, the axis of said cylinder extending at a relatively small angle to the horizontal; of a plate-supporting table rotatable on said axis, said table

- having spaced point supports for the plate and means for clamping the edges of the plate taut with respect to the table; door closure means for the tank on its upper inclined face, said closure means, when open, permitting ready access to the entire upper surface of a plate secured to the table for pouring the film solution thereon from the center radially outwardly to the periphery; means for admitting a current of air near the bottom of the tank adjacent the periphery of the plate and for withdrawing the air from the top of the tank whereby the currents of air travel substantially parallel to and in contact with both surfaces of the plate from point of admission to exit; and a baffle plate over the air exit to prevent the film solution entering thereinto.

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