An apparatus for washing away the water soluble areas of a plastic emulsion covering a plate used in printing operations. Portions of the normally water soluble plastic emulsion become insoluble in water when exposed to actinic or ultraviolet light through a light dark master. The apparatus of the invention consists of a housing wherein water is sprayed uniformly over a printing plate by an arrangement of nozzles to remove the portions of the plastic emulsion remaining water soluble. The nozzles reciprocate to uniformly spray all areas of the emulsion coating, developing thereon, in plastic relief, a representation of the light dark master. The reciprocating nozzles also cyclically apply heated air to the developed plate. The printing plate is releasably maintained within the apparatus housing by adjustable spring clamps which secure the corners of the printing plate to a wash surface on a door of the housing.
SINGLE EXPOSED PLASTIC RELIEF IMAGE PRINTING PLATE WASHER

BRIEF DESCRIPTION OF THE INVENTION

1. Field of the Invention
   This invention relates to apparatus for washing away the water soluble portions of an exposed plastic printing plate.

2. Prior Art
   The present invention is intended to be used particularly with plastic image printing plates of the type disclosed in my pending application for U.S. Patent No. 80,250, filed Oct. 12, 1970. Prior to the present invention, to the best of my knowledge, there has not been known a water washing apparatus suitable for continuously and completely washing such plates.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide a low cost, reliable and efficient washing apparatus for removing the water soluble areas of the plastic emulsion covered printing plate of the type disclosed in my aforesaid application for United States Patent.

Another object is to provide means within the apparatus for the removal of water collected on the developed plate.

Another object is to provide an apparatus having means associated therewith for automatically controlling printing plate washing and drying operations within the apparatus of the invention.

Still another object is to provide means for easily and releasably securing a printing plate within the apparatus of the invention.

Principal features of the invention include a housing with a hinged access door through a front wall thereof. The inner face of the door serves as a wash surface and has adjustable, swiveling, spring clamps thereon to releasably secure an exposed plastic emulsion covered printing plate. Within the housing a rack of nozzles is arranged to reciprocate on tracks and to spray water or air uniformly towards the wash surface. The nozzles are staggered to uniformly spray the entire surface of a plate on the wash surface as the rack is moved by an arm arrangement back and forth in front of the plate.

A single flexible line, having one end connected to the rack of nozzles, has its other end coupled to two valve controlled water or air lines that alternately supply either water or heated compressed air. Timers alternately open the valve in the passing water line, then after a pre-set wash period closes that valve and opens the valve in the air line to allow passage of heated compressed air through the flexible line and nozzles. Thereafter, the valve in the air line is closed, stopping heated air flow, the drive motor for the rack is turned off and an air heater through which the compressed air is directed prior to its passage through the second valve is turned off.

A drain is provided leading from the bottom of the housing to carry off wash water and an air temperature control switch, the timers for the water and heated compressed air cycles, start stop buttons, and a programmer switch are all located on a control panel at the front of the housing.

Additional objects and features of the invention will become apparent from the following detailed description and drawings disclosing what is presently contemplated as being the best mode of the invention.

THE DRAWINGS

FIG. 1 is a perspective view of the invention shown from the one side and slightly above the housing;

FIG. 2, a vertical section view taken on the line 2—2 of FIG. 1;

FIG. 3, a rear elevation view of the invention with a housing access panel partially broken away to expose the interior components;

FIG. 4, a horizontal section view taken on the line 4—4 of FIG. 2;

FIG. 5, a vertical section view taken on the line 5—5 of FIG. 2 and showing the reciprocating spray nozzle arrangement of the invention;

FIG. 6, a vertical section view taken on the line 6—6 of FIG. 2, showing the inner face of the housing door on which are mounted adjustable swivelling spring clamps, whereby the door face becomes a wash surface; and

FIG. 7, an enlarged view, taken on the line 7—7 of FIG. 6, and showing a spring clamp and the mounting therefore.

DETAILED DESCRIPTION

Referring now to the drawings:

In the illustrated preferred embodiment, the cyclic plastic relief image printing plate washing apparatus, shown generally at 10, includes a housing 11, supported on legs 11a, having an access panel 12 forming a rear face thereof and with a door 13, pivotally mounted at 14 providing access through the housing front face. Door 13 has a handle 13a mounted thereon forming part of a latch 13b, FIG. 6, that can be turned into engagement with housing 11 such that the door 13 is sealed to the housing. A resilient seal 15 extends peripherally around the inside of door 13 to insure complete watertight sealing of the door with housing 11.

As best seen in FIG. 6, door 13 has adjustable spring clamps 16 mounted on its inner face. The spring clamps each consist of a block 17 having one end of a hairpin spring 18 extending therethrough and bent as shown at 18a, FIG. 7, to keep it from being pulled through and the other end 18b of the spring in engagement with the inner face of door 13. Each block 17 slides along a square cross-sectional rod 19 that is inserted therethrough such that blocks 17 can be moved towards or away from each other to accommodate plastic printing plates of various widths. The ends of rods 19 are fitted into sleeves 20 that are slidably mounted on straps 21 which have their ends respectively attached by screws 21a to the top and bottom of door 13. Thus, rods 19 can slide towards or away from each other to accommodate plastic printing plates of various lengths. Set screws 20a, threaded into sleeves 20, when turned into the sleeves 20 engage the straps 21 locking the sleeves thereto.

An exposed plastic printing plate is developed in the plate washing apparatus 10 by positioning it on the wash surface and positioning the ends 18b of the springs 18 over the corners of the plate. Door 13 is then closed and latched, thereby positioning the printing plate directly opposite to a reciprocating nozzle rack 22.

Nozzle rack 22 consists of a pair of tubes 23 interconnected at their ends to be continuous, and spaced
nozzles 24 projecting from the tubes. A flexible line 25 is connected to a top portion of the continuous tubes 23, and supplies either water or heated compressed air to the nozzles 24 in a manner to be hereinafter described in detail.

Brackets 26 and 27 are clamped to tubes 23 by straps 28a and 28b and bolts and nuts 29a and 29b. Bracket 26 has top and bottom grooved wheels 30 and 31 journaled thereto and arranged to roll freely above and below, respectively, on a round rod 32 that is fixed between opposite side walls of housing 11. Another rod 34 has its ends fixed between the housing sides to serve as a guide track on which grooved wheels 33 journaled to bracket 27, roll.

As shown best in FIG. 5, nozzle rack 22 is reciprocated by back and forth movements of the upper end 35a of an arm 35. Arm 35 has its lower end 35b pivotally connected at 36 to the bottom of housing 11. The upper end 35a of arm 35 has a slot 37 formed therein, through which a bolt 29a is fitted to loosely secure arm end 35a between strap 28a and bracket 26. As arm 35 is oscillated back and forth around pivot connection 36 travel of bolt 29a within slot 37 reciprocates rack 22 back and forth. Arm 35 is pivotally connected intermediate pivot connection 36 and slot 37, at 38, to one end 39a of a drive arm 39. The other end 39b of arm 39 is pivotally connected at 40 to the end 41a of a short linkage arm 41, the other end 41b of which is fixed to the output shaft of a motor 42, shown best in FIG. 2. As the output shaft of motor 42 turns, linkage short arm 41 is rotated, thereby turning the pivot connection 40 and reciprocating drive arm 39 to oscillate arm 35.

Water or heated compressed air is supplied to the nozzle rack 22 through the flexible line 25. The flexible line, FIG. 4, is connected through a tee 43 to an air line 44 and to a water line 45. Valves 46 and 47 are positioned in lines 44 and 45, respectively, to control flow therethrough. The operation of valves 46 and 47 is controlled, as will be hereinafter explained, by timers that alternately allow water and air to flow through flexible line 25. A coupling 48 is provided on the end of water line 45 opposite tee 43 for connection to a water source, not shown. Compressed air is introduced into the washing apparatus 10 through a coupling 49 connected to a source, not shown, line 50, an air heater 51, air line 44, valve 46, the flexible line 25 and rack 22. The temperature to which air is raised within air heater 51 is controlled by a thermostat 53, mounted to a control panel 52, on the front of housing 11, above door 13.

Control panel 52 also contains other control and programming means that regulate the operations of the plate washing apparatus 10. As best shown in FIG. 5, the control and programming means consists of the thermostatic control 53, which controls the heating of compressed air in air heater 51, a washer timer 54, and a drying timer 55. Washer timer 54 programs the opening and closing of valve 47 to regulate water flow through the nozzles 24 of the nozzle rack 22 to wash away portions of a printing plate emulsion. Drying timer 55 operates alternately with washer timer 54 and when valve 47 is closed to open valve 46 so that compressed air will be distributed through nozzles 24. Drying timer 55 also regulates on-off operation of the air heater 51, with the heat level of the heater being controlled by the thermostatic control 53. Start button 56 and stop button 57 are also provided on panel 52 to control electrical power to the washer apparatus and to start and stop the motor 42 that reciprocates nozzle rack 22. Stop button 57 is electrically connected through a programmer switch 58 to timers 54 and 55 such that when a timer runs out completing a cycle, as controlled by programmer switch 58, the stop button mechanism is activated, turning off electrical power to the apparatus. Programmer switch 58 is a two position switch whose positioning electrically connected to provide either a cycle of operation having both a wash and a dry cycle, or a drying cycle alone. The controls on control panel 52 allow the apparatus to be pre-set for automatic developing of an exposed plastic relief image printing plate positioned on the wash surface and allow the apparatus to be set to include additional drying cycles should the plate being developed not be completely dried in a normal wash dry cycle.

Although a preferred form of my invention has been herein disclosed, it is to be understood that the present disclosure is made by way of example and that variations are possible without departing from the scope of the hereinafter claimed subject matter, which subject matter I regard as my invention.

I claim:
1. A cyclic, exposed plastic relief image printing plate washer comprising
a housing;
a door providing access to the interior of the house; means on an inner face of the door for clamping a printing plate thereto, said means comprising sets of blocks with each set mounted to be moved in two directions normal to one another and with the sets being movable parallel to one another, and hairpin springs each having one end pivotally mounted in one of said blocks and its other end biased towards the inner surface of the door whereby a printing plate positioned between the spring and the door is securely held in place to be washed;
nozzle means within the housing through which water and air are alternately sprayed against an entire exposed surface of said printing plate; and means for alternately supplying the water and air through said nozzle means.
2. A cyclic, exposed plastic relief image printing plate washer as recited in claim 1, wherein the nozzle means includes a nozzle rack having wheels journaled thereto; and including rails mounted between sides of the housing to serve as guide tracks for said wheels; and means for reciprocating said nozzle rack, said reciprocating means comprising a motor,
a linkage arm having one end connected to being turned by the motor,
a driver arm having one end pivotally connected to the other end of the linkage arm, and
an oscillating arm pivotally connected at one end to the housing and pivotally connected intermediate its ends to the other end of the driver arm, said oscillating arm having a slot in the other end thereof and pivot means extending
through the slot and connected to the rack of nozzles.

3. A cyclic, exposed plastic relief image printing plate as in claim 2, further including means for heating air supplied through the nozzles.

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