

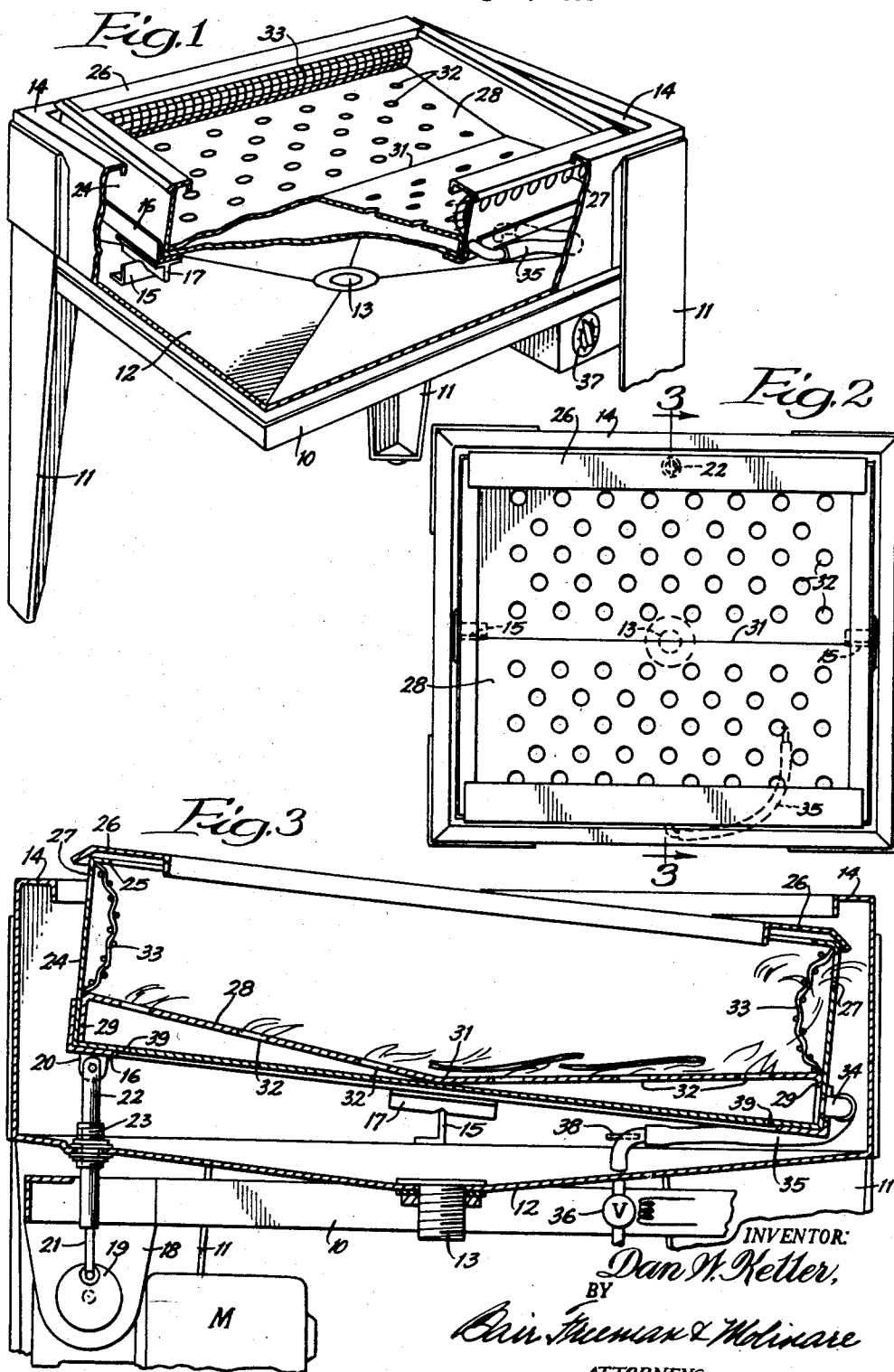
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PRINT WASHER

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PRINT WASHER

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This invention relates to print washers and more particularly to apparatus for washing photographic prints after development and fixing or with chemicals of various kinds for developing and fixing operations.

The present invention is primarily concerned with the washing of photographic prints with water after development and fixing to remove the fixing solution. Washers of this type heretofore manufactured have been relatively large and expensive and have required relatively large amounts of water to accomplish an effective washing job. Water consumption is, in many cases, very important due not only to the cost of the water itself, but to the necessity in many instances of heating the water to obtain proper washing temperature.

It is one of the objects of the present invention to provide a print washer which is small and compact and is therefore relatively inexpensive to manufacture.

Another object is to provide a print washer in which effective washing is accomplished rapidly with a low rate of water consumption.

Still another object is to provide a print washer in which the prints are washed in an oscillating or rocking pan which is rocked at a rate to produce a single wave of water traveling back and forth across the pan. It has been found that this can be accomplished by maintaining the water at a depth of less than one-sixth of the pan width and rocking the pan at such a rate that the low side starts to rise just before the wave reaches it.

A further object is to provide a print washer in which a perforated bottom sheet is mounted in the pan spaced above the bottom thereof at the sides of the pan and engaging the pan bottom along its center line to produce upward surges of water to hold the prints suspended in the water.

A still further object is to provide a print washer in which water overflows at the ends of the pan and is supplied between the bottom sheet and the pan bottom.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which:

Figure 1 is a perspective view of a print washer embodying the invention with parts broken away and in section;

Figure 2 is a top plan view of the print washer; and Figure 3 is a section on the line 3—3 of Figure 2.

The print washer as shown comprises an upper rectangular frame 10 mounted on legs 11 to support the washing mechanism at a convenient height for use. The legs at their upper ends project above the frame 10 to carry a rectangular container 12 whose bottom tapers downwardly to a central drain opening 13 and whose sides extend upward and terminate in inwardly turned flanges 14. At the two ends of the container centrally of its width there are mounted knife edge supports 15 which may be in the form of short L-sections welded or otherwise rigidly secured to the container bottom with one flange extending upward therefrom.

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The knife edges 15 rockably support a rectangular frame 16 which may be formed of L-section beams mounted with their lower flanges extending inwardly and their outer flanges extending upwardly to support a pan, as described hereinafter. The end pieces of the frame 16 carry downwardly extending knife edge members 17 which may be in the form of short T sections notched at their center portions to rest on the upper edges of the members 15. In this way, the frame 16 is mounted for free rocking or oscillating movement about the members 15 to effect the washing action.

To rock the frame a motor 18 is supported by the frame 10 and drives a disc 19 through suitable gear reduction mechanism. The disc 19 carries a crank pin to which a link is connected to rock the frame 16. As shown, the link is formed of a metal rod member 21 pivoted on the crank pin and connected to an extension element 22 formed of a plastic material, such as nylon. Use of the nylon extension electrically insulates the motor from the parts within the container, thereby eliminating possibility of electric shock to the user. Further, the nylon rod can slide through a bushing 23 in the bottom of the container freely and without requiring lubrication. The upper end of the rod 22 is pivotally connected to a bracket 20 secured to one of the end members of the frame 16 so that as the motor 18 runs the frame 16 will be rocked about the pivots 15.

The frame 16 supports a flat open topped pan 24 in which the actual washing is accomplished. As shown, the pan 24 is of a size to fit closely in the frame 16 and has a flat bottom and straight upstanding sides terminating in narrow inwardly turned flanges 25. Preferably a splash shield 26 is fitted over the upper end of the pan to eliminate splash during operation. The pan is adapted to contain water to a level determined by overflow openings 27 in the ends of the pan through which water can overflow into the container to be carried by the drain 13.

To insure that prints being washed will not sink to the bottom of the pan and remain there a bottom sheet 28 is provided in the pan. As shown, the sheet 28 has downwardly turned flanges 29 at its ends to space its end portions above the bottom of the pan and is bent downwardly at its center to contact the pan bottom along a line 31 lying above the parallel to the pivotal axis of the pan. The bottom sheet 28 is formed with a plurality of openings 32 therethrough through which water can flow in either direction.

I have found that the size and number of openings employed is critical for the production of the desired washing results. In operation, water will flow downwardly through the openings and will surge upwardly through the openings to elevate the prints above the bottom sheet. If insufficient openings are provided there will not be sufficient surging flow to elevate the prints while if the total area of the openings is too great, the flow will be too low a rate to accomplish good results. In actual practice, I have found that if the openings 32 are made of a diameter of 2 inches, the operation is ineffective, but that when the openings are between 3/4 inch and 1 1/4 inches and have a total area equal to at least 5% of the total plate area and not greater than 10% of the total plate area very effective results are achieved.

When small prints are being washed, there is a tendency for them to lie against the end walls of the pan and to stick so that the washing is not effective. To prevent this, curved screen strips 33 are pressed in between the upper edge of the bottom sheet 28 and the flanges 25 at the ends of the pan to bow outwardly from the ends of the pan, as shown in Figure 3. These screen strips will prevent small prints from lying against the

ends of the pan, but may be omitted when larger prints are being washed.

Water is supplied to the pan through a connection 34 at one end of the pan above the level of the pan bottom and below the bottom sheet 28. The connection 34 is supplied through a flexible hose 35 under the control of a solenoid valve 36. The valve 36 and the motor 18 may be controlled by a timer 37, as shown in Figure 1, so that the washing operation may be automatically timed.

According to one feature of the invention, the water supplied to the washer is aerated to cushion the action and to provide more effective washing. In actual practice, the valve 36 is constructed to introduce air into the water, but, as illustrated, air may be introduced through a short tube 38 extending into the water connection immediately ahead of the flexible hose 35 to introduce air into the flowing stream of water. To effect complete drainage of water from the pan at the end of a washing operation, small openings, as shown at 39, may be provided near the corners of the pan through which the water can drain at a low rate so as not to interfere with a normal washing operation, but to permit complete drainage of the pan when the washer is stopped.

In operation, prints to be washed are placed in the pan above the bottom sheet 28, water is introduced into the pan and the motor 18 is started to rock the pan. As the pan rocks, a wave of water will travel back and forth across the pan breaking against the ends thereof. Depth of the water in the pan is controlled by the height of the overflow openings 27 and water is constantly introduced to effect a thorough washing action. As the pan rocks, water will flow through the openings 32 toward the low side of the pan and later will flow upwardly from the openings 32 near the lower end of the pan as the rocking continues. This creates a constant upsurge of water beneath the prints holding them off the bottom sheet and maintaining them fully suspended in the water so that they will be effectively washed.

I have found, according to one feature of the invention, that the rate of rocking relative to the width of the pan and the depth of water is extremely important. For example, for most effective washing it is necessary that the pan be rocked at such a rate that only a single wave of water will be created which will travel back and forth across the pan and which will break over at the ends of the pan above the prints supported in the water to hold them down in the water and wash them effectively. It has been found that when this action is achieved, breaking of the wave over the prints and flow across the pan will keep the prints effectively separated so that all surfaces are effectively washed.

To accomplish the desired washing action, the width of the pan, the depth of the water therein and the rate of rocking must be accurately correlated. I have found, for example, that the water depth must be less than one-sixth of the pan width to produce the desired wave action. For example, in a pan 24 inches wide it was found that the desired wave action could not be produced with a water depth of $4\frac{3}{4}$ inches, whereas a highly desirable action was produced with a water depth of $3\frac{3}{4}$ inches.

The rate of rocking of the pan must also be so related to the pan width that the low side of the pan will start to rise just before the traveling wave of water reaches it. The wave is then turned to recross the pan with a minimum of splash and with the desired curling over action to wash across the tops of the prints and flow along them to accomplish effective washing. While no precise formula has been derived to express this relationship, the necessary rate of oscillation can easily be determined by observation. I have found, for example, with a pan 24 inches wide and with a water depth of $3\frac{3}{4}$ inches the desired wave action is not obtained with 24 cycles

per minute, whereas ideal wave action is achieved with 29 cycles per minute.

The rate of water supply has also been found to be quite critical. To accomplish a commercial wash, for example, it has been found that the optimum rate of supply is approximately 2 gallons of water per minute supplied through the connection 34. In a device of the size referred to this will effect between 12 and 16 complete changes of water per hour which has been found to be optimum. Tests have indicated that the time required for commercial washing with this rate of water supply is approximately 26 minutes, as compared to a time of 33 minutes at a rate of $\frac{1}{2}$ gallon per minute and 38 minutes at a rate of 4 gallons per minute. This is an important feature in the conservation of water and particularly of heating water where the necessity of heating the initial water supply exists.

It will be seen that the present washer is extremely compact in size and will produce a highly effective washing action. With a washer of the size mentioned above, namely 24 inches in width, prints up to 20 inches in width can be effectively washed and any smaller prints can also be effectively washed in the same apparatus. The apparatus therefore has a high degree of flexibility in use.

While one embodiment of the invention has been shown and described herein, it will be understood that it is illustrative only and not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, and a perforate bottom in the pan spaced above the pan bottom at the front and rear edges of the pan and contacting the pan bottom centrally thereof and substantially above the pivotal axis.

2. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, a perforate bottom in the pan spaced above the pan bottom over the major portion of its area for flow of liquid beneath and through the perforate bottom, the perforated bottom being formed with a series of holes of a diameter between $\frac{3}{4}$ inch and $1\frac{1}{4}$ inches and a total area between 5% and 10% of the area of the bottom.

3. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, a perforate bottom in the pan spaced above the pan bottom over the major portion of its area for flow of liquid beneath and through the perforate bottom, a liquid supply connection to the lower part of the pan beneath the perforate bottom, and liquid discharge openings in the ends of the pan spaced above the bottom thereof.

4. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, a perforate bottom in the pan spaced above the pan bottom at the front and rear edges of the pan and contacting the pan bottom centrally thereof and substantially above the pivotal axis, a liquid supply connection to one end of the pan beneath the perforate bottom, and liquid discharge openings in the ends of the pan above the bottom thereof.

5. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its

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width and adapted to contain liquid, means for rocking the pan about its axis, the pan having discharge openings at its ends to limit the depth of liquid therein and spaced above the bottom of the pan a distance less than one-sixth the pan width, the rocking means being adjusted to rock the pan at a rate such that the low side of the pan starts to rise just before a wave of liquid reaches it.

6. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, the pan having liquid discharge openings in its ends spaced above its bottom, a water supply connection to one end of the pan beneath the perforate bottom, and means to regulate water supplied through the connection to a rate to effect from twelve to sixteen changes of water in the pan per hour.

7. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, the pan having liquid discharge openings in its ends spaced above its bottom, a water supply connection to one end of the pan beneath the perforate bottom, means to aerate water supplied through the connection, and means in the connection to regulate the supply to a rate to effect twelve to sixteen changes of water in the pan per hour.

8. A print washer comprising a flat pan having imperforate side, end and bottom walls mounted for pivotal movement about a horizontal axis central of its width and adapted to contain liquid, means for rocking the pan about its axis, a bottom sheet in the pan spaced above the pan bottom at the front and rear of the pan and engaging the pan bottom centrally of the pan, the bottom sheet being formed with a series of spaced holes

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therethrough, the pan having outlet openings in its front and rear side walls spaced above the pan bottom, a liquid supply connection to one end of the pan beneath the bottom sheet, and means in the supply connection to regulate the supply of liquid to a rate to effect twelve to sixteen changes of liquid per hour.

9. A print washer comprising an open topped fixed container, an open topped flat pan having imperforate side, end and bottom walls mounted in the container for pivotal movement about a horizontal axis, a motor mounted beneath the container, means extending through the bottom of the container and connecting the motor to the pan to rock the pan when the motor is running, a flexible water inlet conduit extending through the container and connected to the pan, a perforated bottom sheet in the pan spaced above the pan bottom at its ends and engaging the pan bottom at its center, the inlet conduit opening into the pan below the bottom sheet, the pan having water discharge openings in its ends spaced above its bottom, and a drain connection to the container.

10. The construction of claim 9 including foraminous strips overlying and spaced from the end walls of the pan to prevent prints from sticking thereto.

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