United States Patent

Black et al.

[15] **3,656,493**

[45] **Apr. 18, 1972**

[54] SCREEN WASHING APPARATUS

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[22] Filed: **Sept. 11, 1969**

[21] Appl. No.: **857,163**

[52] **U.S. Cl.** **134/113,** 134/144, 134/165, 134/172, 134/200

[51] **Int. Cl.** **B08b 3/02,** B08b 11/02

[58] **Field of Search** 134/113, 140–141, 134/144, 148, 151–152, 165, 172, 181, 194, 200, 167

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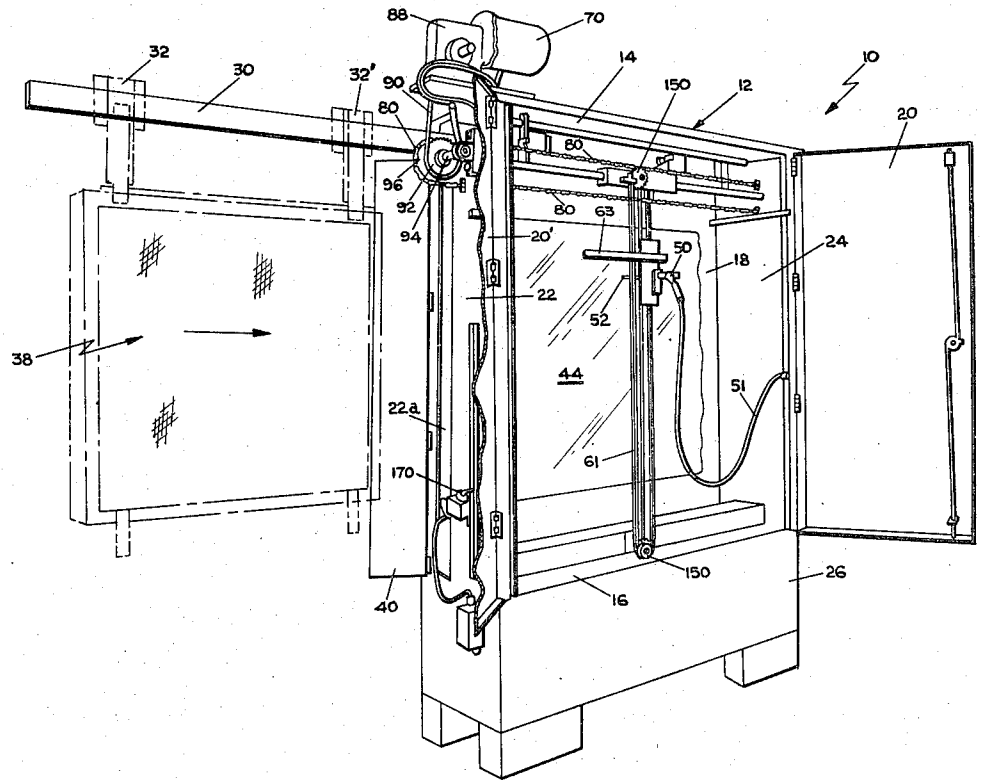
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[57] **ABSTRACT**

Screen stencil washing apparatus with an enclosure cabinet having screen loading means extending between the exterior and the interior of the cabinet, the cabinet containing a washing gun support means advanceable across the area of the screen by controlled bidirectional movement using two interrelated conveyance means, one in one dimension and the other transversely thereto, the one having a sweeping movement and the other an incremental advancement. Lighting means is arranged to allow visual inspection upon completion of the washing cycle, through access doors. The washing gun is removable from its support means for manual washing of any local areas.

3 Claims, 8 Drawing Figures



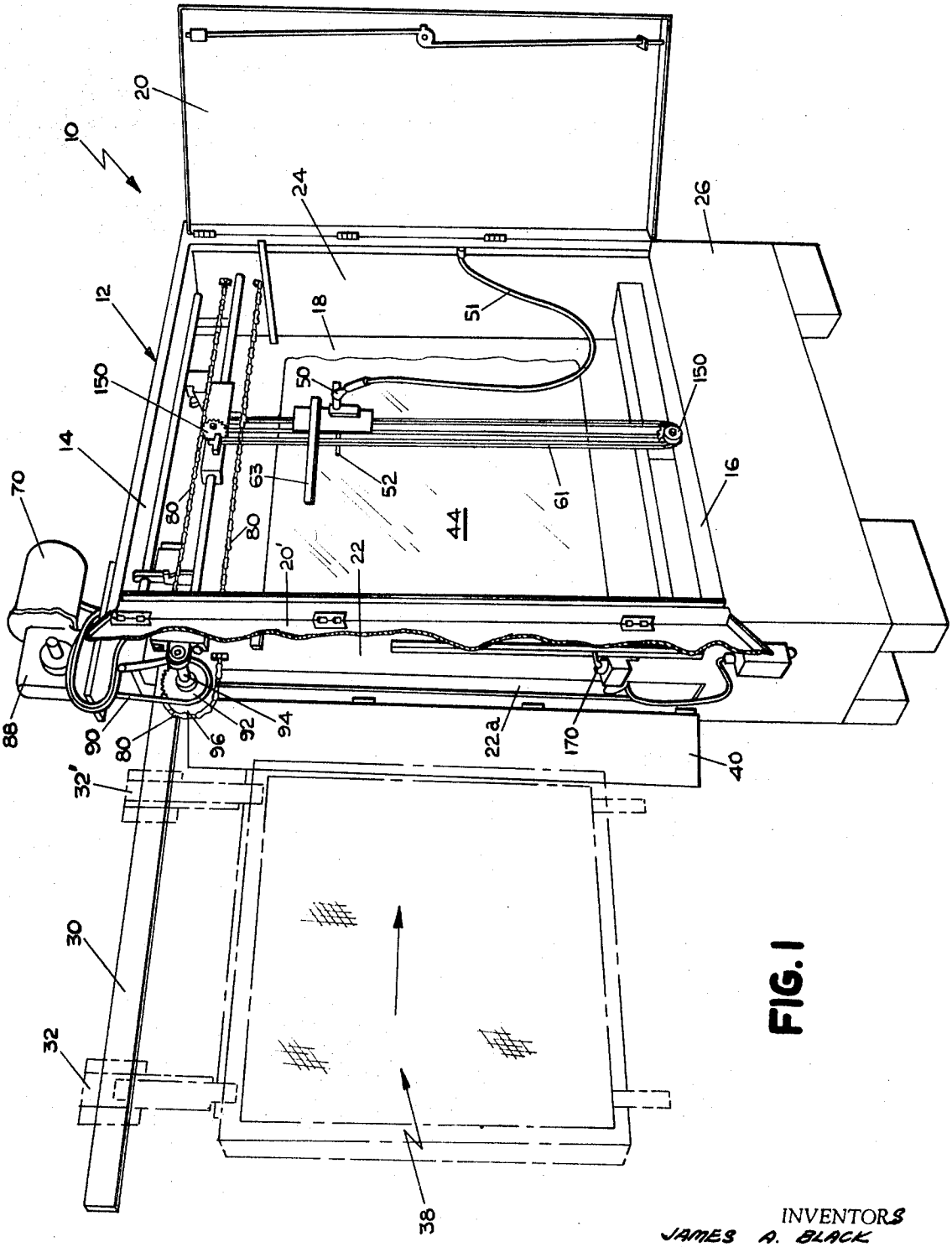


FIG. 1

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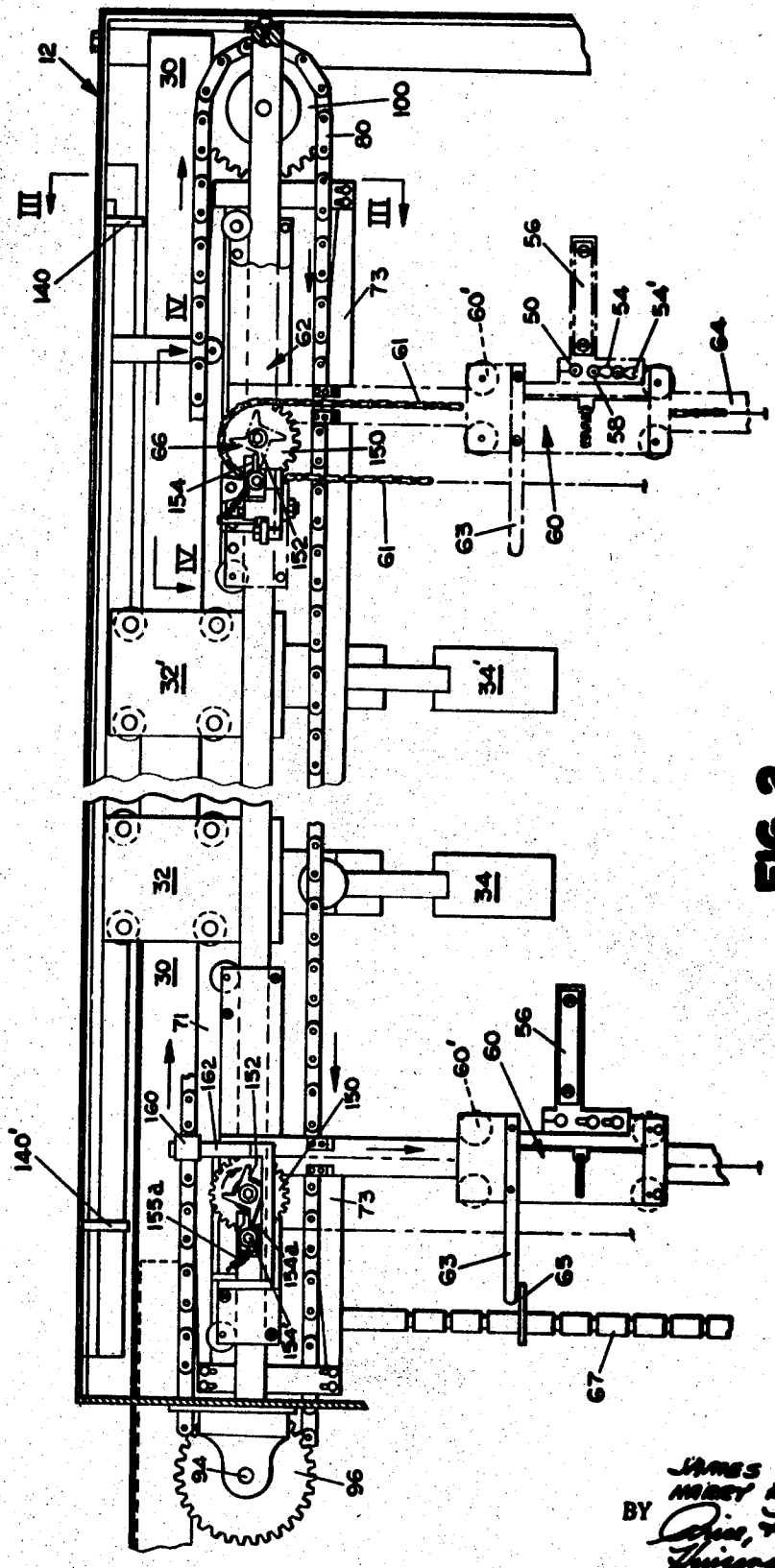


FIG. 2

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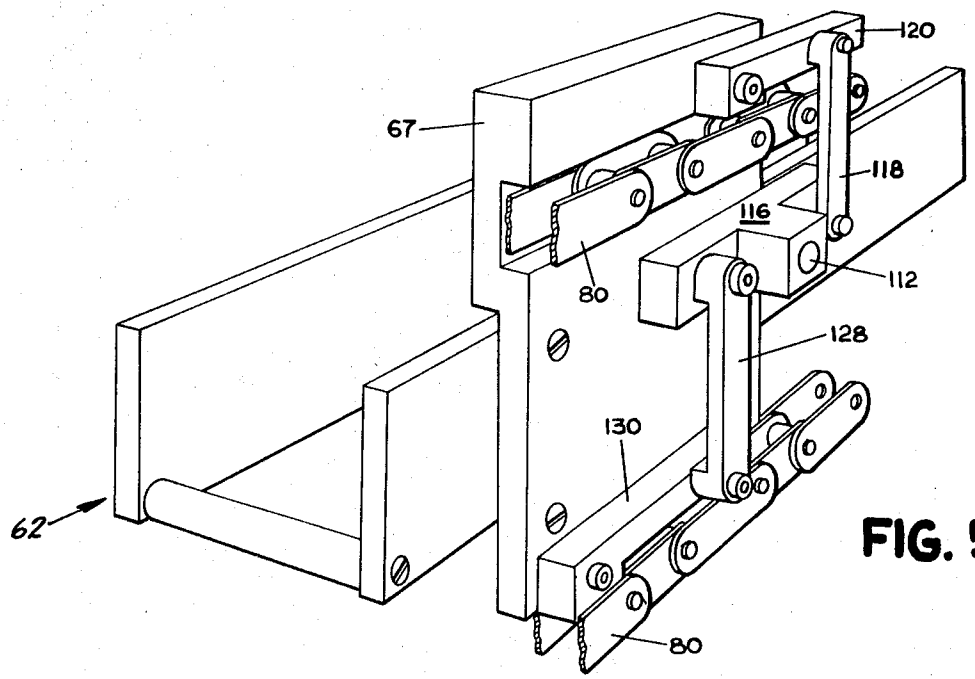


FIG. 5

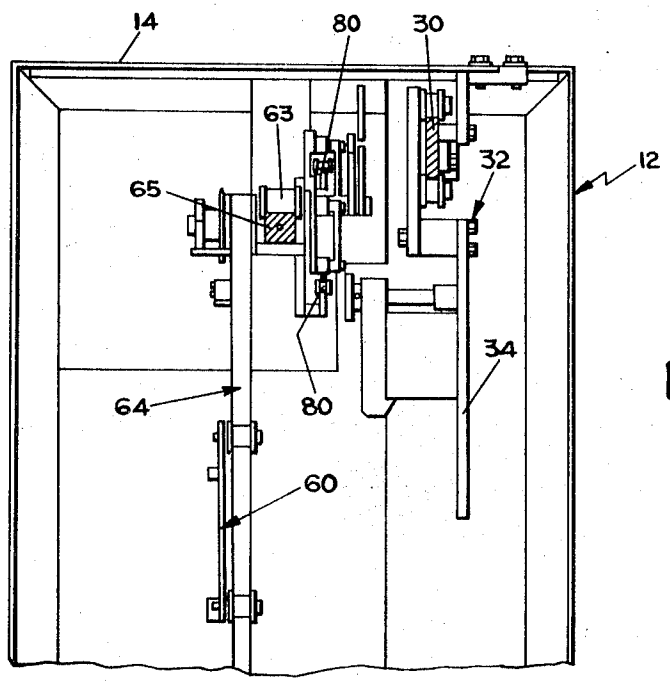


FIG. 3

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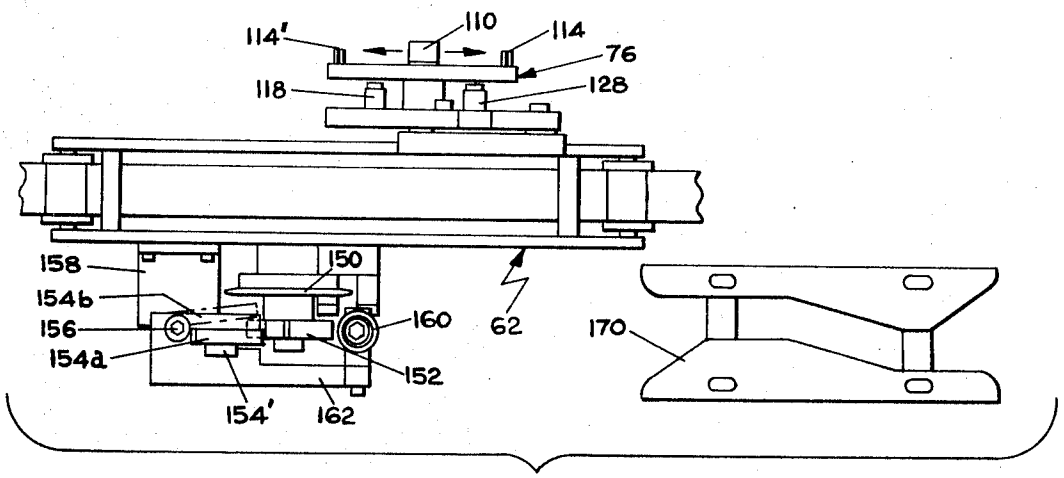


FIG. 4

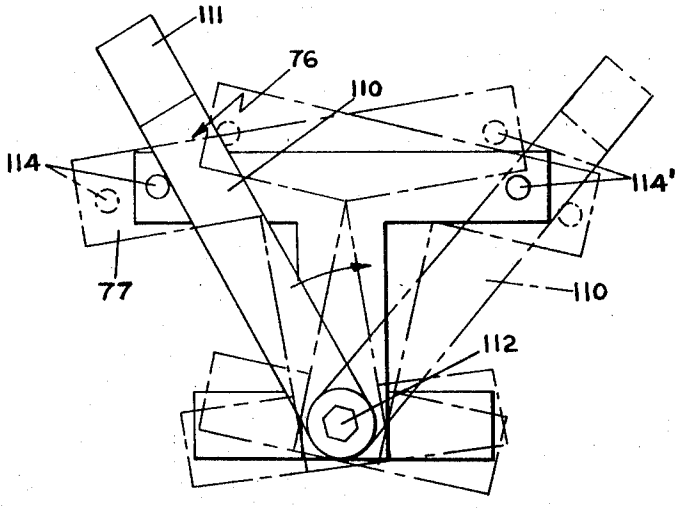


FIG. 8

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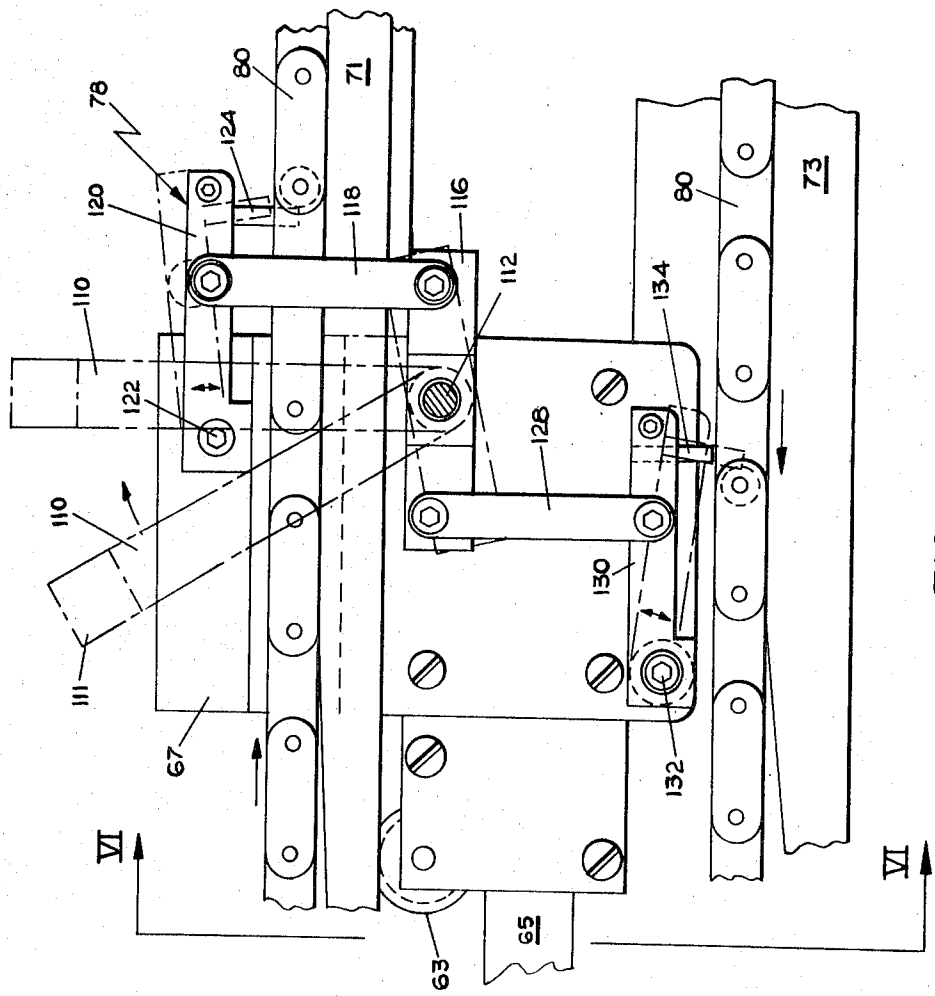


FIG. 7

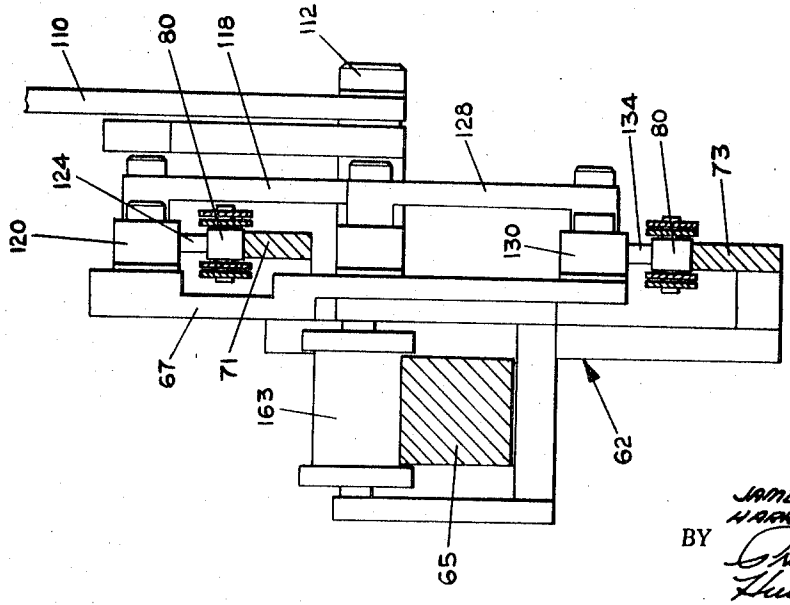


FIG. 6

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SCREEN WASHING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to stencil screen washing apparatus employing controlled sweeping action of a washing gun.

Cleaning of stencil screens in the printing industry is normally done manually. Not only is this tedious to the worker, but requires a substantial amount of time and considerable attention to remove the ink from every tiny screen square. The worker is moreover exposed to high pressure steam and water vapor commingled with splattering ink. Consequently, the skilled personnel usually found in the printing industry are reticent to perform this chore.

SUMMARY OF THE INVENTION

An object of this invention is to provide stencil screen washing apparatus that controllably and thoroughly washes the entire planar area of stencil screens with a minimum of operator time and attention. This is done in a protective zone, enabling a high pressure cleaning jet to be used without splattering of the cleaning liquid or ink onto the operator. The cleaning jet means sweeps over the screen in controlled fashion, in a two-dimensional movement pattern.

The apparatus includes, in a housing, cleaning jet means mounted on two inter-related conveyors, one having a sweeping feed and the other an incremental feed. Trolley and track means between the exterior and interior of the housing allow easy loading and unloading of a stencil screen without interference with the cleaning jet advancing apparatus. Inspection and touch-up access means on the housing is opposite illuminating means.

Specific features and other objects will become apparent upon studying the following detailed specification in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of the novel apparatus;

FIG. 2 is a fragmentary elevational front view of the apparatus in FIG. 1;

FIG. 3 is a sectional view taken on plane III—III of FIG. 2;

FIG. 4 is a fragmentary plan view of a portion of the apparatus taken on plane IV—IV of FIG. 2;

FIG. 5 is a fragmentary perspective view of a portion of the carriage illustrated in FIG. 4;

FIG. 6 is an end elevational view taken on plane VI—VI of the structure in FIG. 5;

FIG. 7 is a fragmentary enlarged elevational view of the carriage drive mechanism; and

FIG. 8 is a front elevational enlarged view of the directional shifter for the carriage drive.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now specifically to the drawings, the complete assembly 10 includes a cabinet housing 12 having a top 14, a bottom 16, a back 18, a front closed by doors 20 and 20' (the latter being shown in fragmentary form), and ends 22 and 24. The cabinet may be mounted on a suitable base 26.

End wall 22 has a vertically elongated opening 22*a* therein, adjacent the back 18, with an elongated trolley track 30 extending through the upper end of this opening. This track 30 has a substantial portion outside of the cabinet and extends substantially the length of the inside of the cabinet. A pair of like trolleys 32 and 32' having a plurality of stencil screen clamping means 34 and 34' depending and suspended therefrom are capable of being moved along track 30 from the position outside the cabinet (FIG. 1) to a position inside the cabinet (FIG. 2). This enables a stencil screen and frame unit 38 to be pushed into the cabinet through opening 22*a*, and retracted from the cabinet, when clean, through this same opening. During the cleaning operation, a hinged door 40 is shifted to cover opening 22*a*.

In back wall 18 of cabinet 12 is illuminating means 44. This may comprise a light diffusing translucent panel which is positioned adjacent a window of the building or some other light source for proper illumination of the entire stencil screen to be cleaned.

Cleaning of the stencil screen is by means of a high pressure water and/or steam gun 50 having a nozzle 52 extending toward the screen, and being mounted on a support 54 that includes a handle 56. Support 54 has a pair of key hole slots 54' which slidably receive a pair of pins 58 affixed to the gun support means 60. Hence, gun 50 may be readily attached to and removed from support 60 by grasping handle 56 and interfitting or unfitting pins 58 from slots 54'.

The mechanism inside the cabinet is arranged such that support 60 with its mounted cleaning gun has a controlled bidirectional movement using two inter-related conveyance means, the one in a vertical dimension and the other in the transverse horizontal dimension. Movement in the horizontal direction is a sweeping, back and forth movement, while that in the vertical dimension is an incremental, downward advancement. The latter is specially controlled with respect to the sweeping action. In this way, controlled coverage of the entire area of the stencil screen is obtained. For illustrative purposes, the cabinet structure in FIG. 2 is shown broken in the center, with the same support 60 being illustrated both in the left and in the right hand portion of the drawing. Gun support means 60 is mounted on shiftable vertical support means, herein vertically oriented endless chain member 61, which in turn is supported by a horizontally traveling carriage 62. Carriage 62 has rollers 163 mounted on a transverse track 65 extending horizontally between the ends of the cabinet. Chain 61 travels about upper and lower spaced sprockets 150. Gun support 60 is guided in its vertical travel by the engagement of its rollers 60' with a vertical guide track 64 having its upper end mounted to carriage 62 so as to move therewith and be suspended therefrom. Incremental downward movement of gun support 60 is caused by its weight, i.e. the force of gravity, and is controlled by a special ratchet mechanism 66 on carriage 62 as disclosed in detail hereinafter. Horizontal sweeping movement of carriage 62 and thus of gun support 60 is caused by an exterior drive motor 70 and controlled by a special shifting mechanism 76 (FIG. 8) cooperative with a drive mechanism 78 (FIG. 7) affiliated with the driven roller chain 80. The upper and lower passes of chain 80 are vertically retained and guided on horizontal tracks 71 and 73 respectively.

Motor 70 powers gear box 88 which in turn drives an endless, recirculating, horizontally oriented drive chain member 90 to sprocket 92 mounted on shaft 94 (FIG. 1). Rotation of shaft 94 drives sprocket 96 and hence chain 80, the other end of chain 80 being around idler sprocket 100 on the opposite end of cabinet 12. Chain 80 recirculates constantly in the same direction as illustrated by the arrows in FIG. 2. Movement of carriage 62 and its attached equipment from the left end of the housing (as viewed in the drawings) to the right end of the housing, and back again, in continuously reversing sweeping fashion is controlled by the shifting structure in FIG. 8 in combination with the chain engaging drive structure in FIG. 7, with the combination of the structures in FIGS. 7 and 8 being shown in FIG. 6.

Specifically, the direction of movement of carriage assembly 62 is controlled by sub-assembly 76. This sub-assembly includes an upright shifter member 110 that is weighted at its over end, as by weight 111, and is freely pivotally mounted at its lower end on pin 112. It is shiftable through an over center arc of about 75° or so between one tilted position against stop pin 114 to the opposite tilting position against stop pin 114'. Pins 114 and 114' are mounted adjacent opposite ends of a T-shaped member 77 (FIG. 8). The function of weighted lever 110, when tilted from one position to the other, is to shift the T-shaped members 77 from one tilted position (solid lines in FIG. 8), through an over center position (phantom lines in FIG. to a second tilted position (phantom lines in FIG. 8).

Member 77 is attached to shaft 112 at the lower end of the stem of the T. Movement of member 77 through its arc therefore causes pivoting of link 116 on pin 112. Pivotally attached to one end of link 116 is the lower end of another link 118 which extends up and has its upper end pivotally mounted to the central portions of lever 120. This lever is pivotally mounted at one end to pin 112 on support plate 67 of carriage 62, and has a drive pin 124 depending from its other end for selective engagement between the rollers of roller chain 80. Similarly, having one of its ends pivotally connected to the opposite end of link 116 is a link 128 which depends downwardly from link 116 and has its lower end pivotally connected to the central portions of link 130. Link 130 has one of its ends pivotally connected by a pin 132 to mounting plate 63, and has a depending drive pin 134 extending from its opposite end for controlled engagement with roller chain 80. Since drive pin 124 engages the upper pass of roller chain 80 that is moving in one direction, and drive pin 134 engages the lower pass of roller chain 80 moving in the other direction, selective engagement of these pins with the upper and lower passes of roller chain can enable the carriage to be shifted in one direction or the other. Movement of shift lever 110 from one position to the other causes it to strike the stop pin and thus causes member 77 to shift. When member 77 is in its position tilting to the left, pin 124 is disengaged from chain 80 as illustrated by the phantom lines in FIG. 7, while pin 134 is engaged with chain 80 as illustrated by the phantom lines. Alternately, when it is moved through its position tilting to the right, it will cause pin 124 to engage and pin 134 to disengage, both as illustrated in solid lines in FIG. 7. All that is needed to flip strike lever 110 from one side to the other is a pair of trip stops 140 and 140' (FIG. 2) on the ends of the cabinet, so that lever 110 advancing with the carriage is restrained from further advancement and hence flipped over center from one position to the other to strike pins 114 or 114' and instantly shift the unit in reverse. The instantaneous action prevents the carriage from being hung up in neutral position.

When carriage 62 reaches each end of the cabinet, not only is its horizontal direction reversed, but also its ratchet mechanism 66 is activated momentarily to enable gun support 60 to drop an incremental amount under the bias force of gravity. More specifically, the weight of gun support 60 tending to bias it in a downward direction on its chain 61 around its upper and lower sprockets 150 is resisted by the engagement of ratchet wheel 152 with pawl mechanism 154, ratchet wheel 152 being mounted on the same shaft as upper sprocket 150. Pawl 154 is actually composed of two cooperative pawl members 154*a* and 154*b* (FIG. 4), both being capable of engaging a tooth of ratchet wheel 152. The pawl mechanism is mounted on a vertical pivot axis 156 to the carriage support plate 158. Pivotal movement about this vertical pivot axis is caused by a cam follower roller 160 which is mounted on the end of an arm 162 fixedly secured to pawl portion 154b. Portion 154*b* is not movable vertically. Portion 154*a* is mounted to the fixed pawl support on a horizontal pivot 154'. It turns horizontally, i.e., laterally with portion 154*b*. Its pivot 154' also allows portion 154*a* to vertically pivot in a limited arc. Ratchet wheel 152 can be controllably released one tooth in two stages using these portions. Normally, ratchet 152 engages portion 154*a* only. Actual release of the wheel occurs by engagement of cam follower roller 160 with a cam track 170 on either end of the cabinet. When this occurs, portion 154*b* engages wheel 152 while portion 154*a* is pivoted (on axis 156) out of engagement with wheel 152. As it does so, tension spring 155*a* (FIG. 2) pivots portion 154*a* on pivot 154' to drop the teeth engaging front end. Then cam follower 160 moves into the rear of cam track 170 to rotate the pawl mechanism back again on vertical axis 156. This disengages portion 154*b* from wheel 152, and re-engages portion 154*a* at the next tooth, so that wheel 152 is free to turn the amount of one tooth. This turning is caused by the weight of the carriage 60 on chain 61. The device is then ready to traverse the cabinet again. This ratchet mechanism is quite conventional.

In operation, therefore, a stencil screen with its frame 38 is suspended on trolleys 32 and 32' outside of the cabinet, door 40 is opened to uncover opening 22*a* and the stencil screen is pushed manually into the cabinet on track 30, to be cleaned. With front doors 20 and 22 open, pressure gun 50 with its attached hose 51 is attached to gun support 60 by inserting pins 58 into key slots 54' on support 54 while manually holding handle 56 of the gun support. With the gun support 60 at the top of chain 61, the unit is activated by actuating motor 70. It thus drives recirculatory chain 80 to propel carriage 62 across the length of the cabinet to cause the pressurized spray from gun 52 to clean out selected rows of the stencil screen. As the carriage reaches the opposite end of the cabinet, lever 110 (FIG. 8) strikes stop 140 so that continued advancement of the carriage causes the lever to be shifted from one position to the other and thereby disengage one drive pin 124 from the upper pass of chain 80 and engage the lower drive pin 134 with the lower pass of chain 80. At the same time, cam follower 160 on arm 162 engages a cam track 170 (FIGS. 4 and 2) to actuate the ratchet mechanism 66 and allow gun support 60 to drop an increment as determined by the distance between the ratchet teeth. Thus, as the gun support moves with the carriage in a reverse direction, the gun cleans the next few rows of the screen below the rows cleaned on the previous pass. This horizontal reversing sweeping action continues, with continuous downward incremental movement of the gun support, over the entire area of the stencil screen. When it reaches a certain vertical height preset by the operator, further downward movement is arrested as by engagement of a trip pin 63 on gun support 60 with an arresting stop 65 (FIG. 8) mounted on support 67, or alternatively, with a limit switch 170 (FIG. 1) to shut off electrical motor 70. If any dirty spots remain, gun 50 is manually removed by grasping handle 56 and sliding slots 54 and 54' off pins 58 to spray manually at the necessary location. The clean screen is then removed from the cabinet on its conveyor, and replaced by a dirty one. The next dirty screen is advanced into the cabinet, carriage is raised to the top again merely by manually pushing it up to the desired height. This causes sprocket 150 to rotate counterclockwise (i.e., opposite to the arrow in FIG. 2), as well as ratchet wheel 152, the latter moving past pawl portion 154*a* which is dropped through a small arc by spring 155*a* when the ratchet teeth do not hold it up in its illustrated horizontal orientation.

It is conceivable that the details of this particular construction shown in the preferred form may be modified in various manners within the concept presented.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Stencil screen washing apparatus comprising a housing: stencil screen conveyance means extending from the exterior of said housing through a stencil inlet and outlet opening to the interior of said housing; spray washing gun support and advancing means inside said housing, including gun support means, first traversing gun conveyance means mounting said gun support means and advanceable in a first dimension in said housing to move across a stencil screen, and second gun conveyance means mounting said first gun conveyance means and advanceable in a second dimension transverse to said first dimension, whereby said gun support means can be advanced over the area of a stencil screen, said gun support being on one side of said stencil screen conveyance means, said apparatus including illumination means on the opposite side of said stencil screen conveyance means for projecting light through said stencil screen, and an access opening with operable access doors on the same side of said screen conveyance means as said gun support to allow an operator visual inspection of a cleaned stencil to determine any unwashed areas of said screen; and means accessible through said access opening and said access doors permitting movement of said gun into position for spraying any unwashed areas of a screen without repeating the entire washing of said screen.

2. The apparatus in claim 1 including power motor means operably connected to one of said first gun conveyance means

to cause sweeping traversing movement of said gun support means in one dimension, and incremental advance control means operably associated with said second gun conveyance means to cause incremental advance of said gun support means in the other dimension.

3. The stencil screen washing apparatus in claim 1 including a washing gun having a removable slip fit connection with said gun support means, to enable said gun to be manually removed for localized cleaning of a stencil.

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