July 10, 1962 H. R. BENSON 3,043,204

PHOTOGRAPHIC PRINTER

Filed March 10, 1959 5 Sheets-Sheet 1

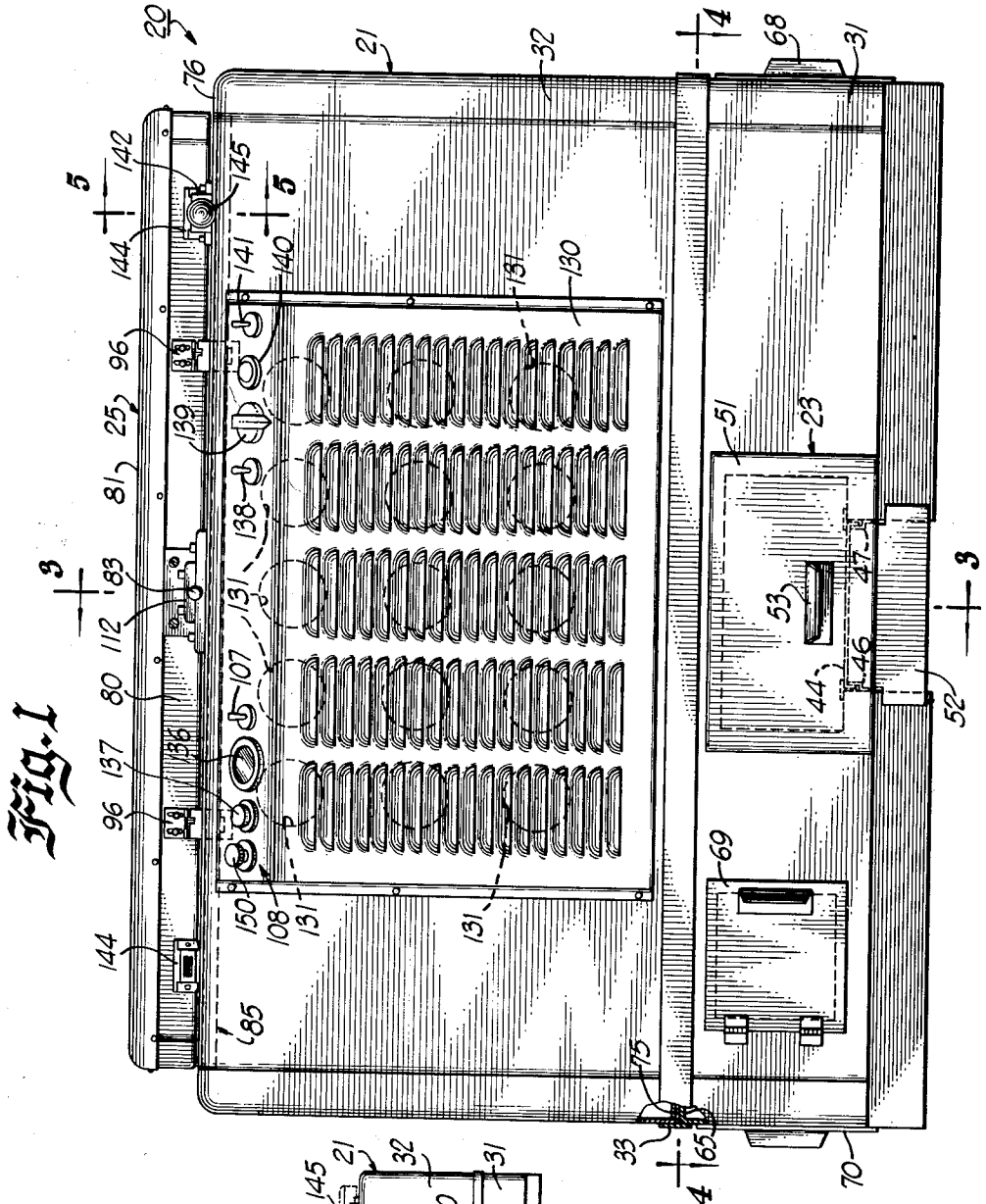


Fig. 1

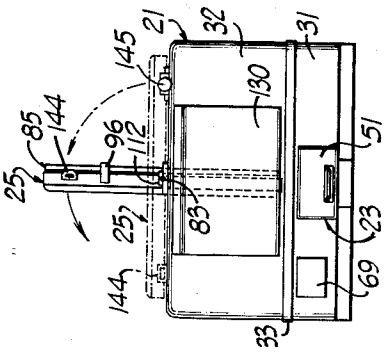


Fig. 2

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PHOTOGRAPHIC PRINTER

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Fig. 3

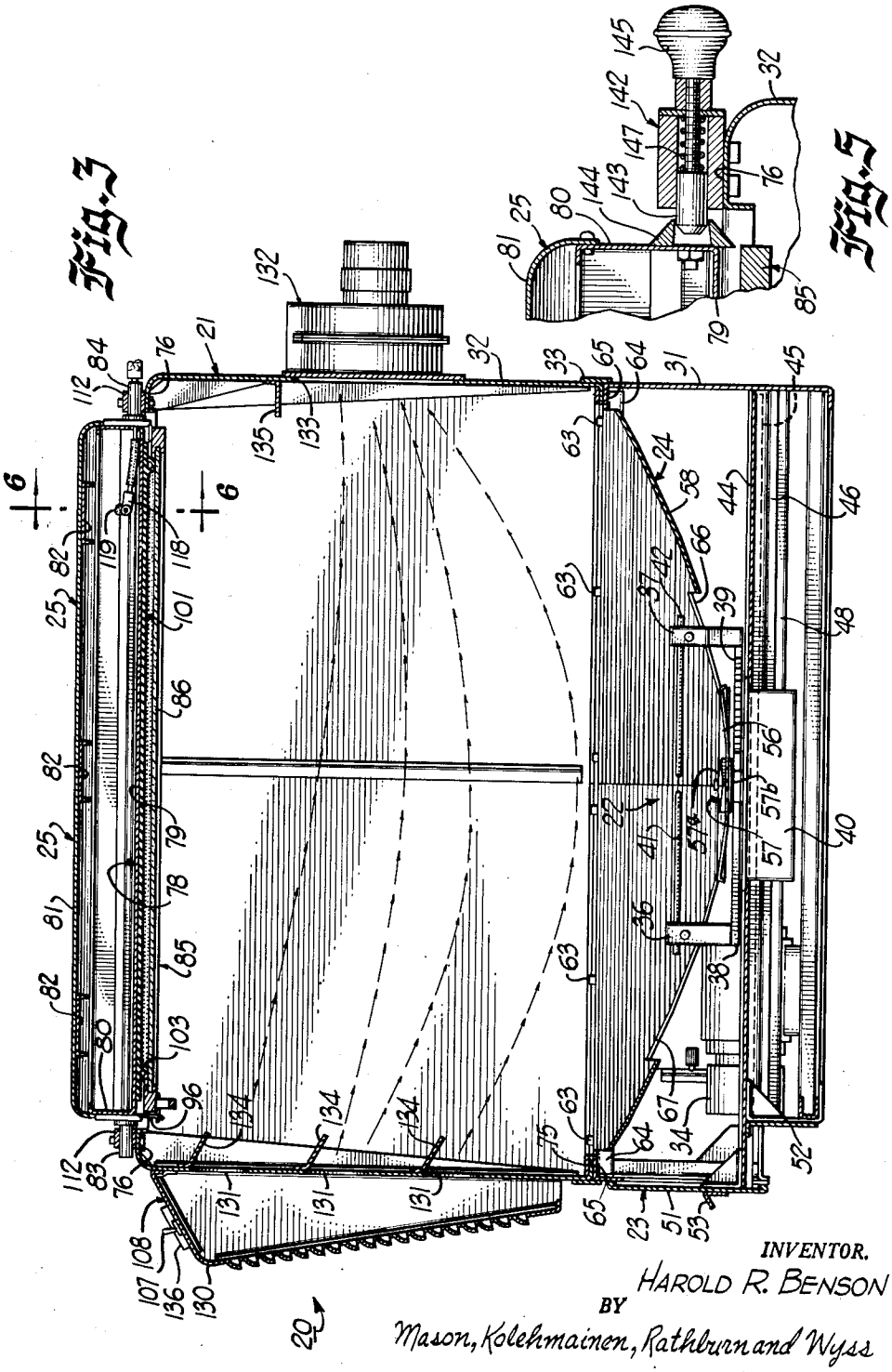


Fig. 5

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PHOTOGRAPHIC PRINTER

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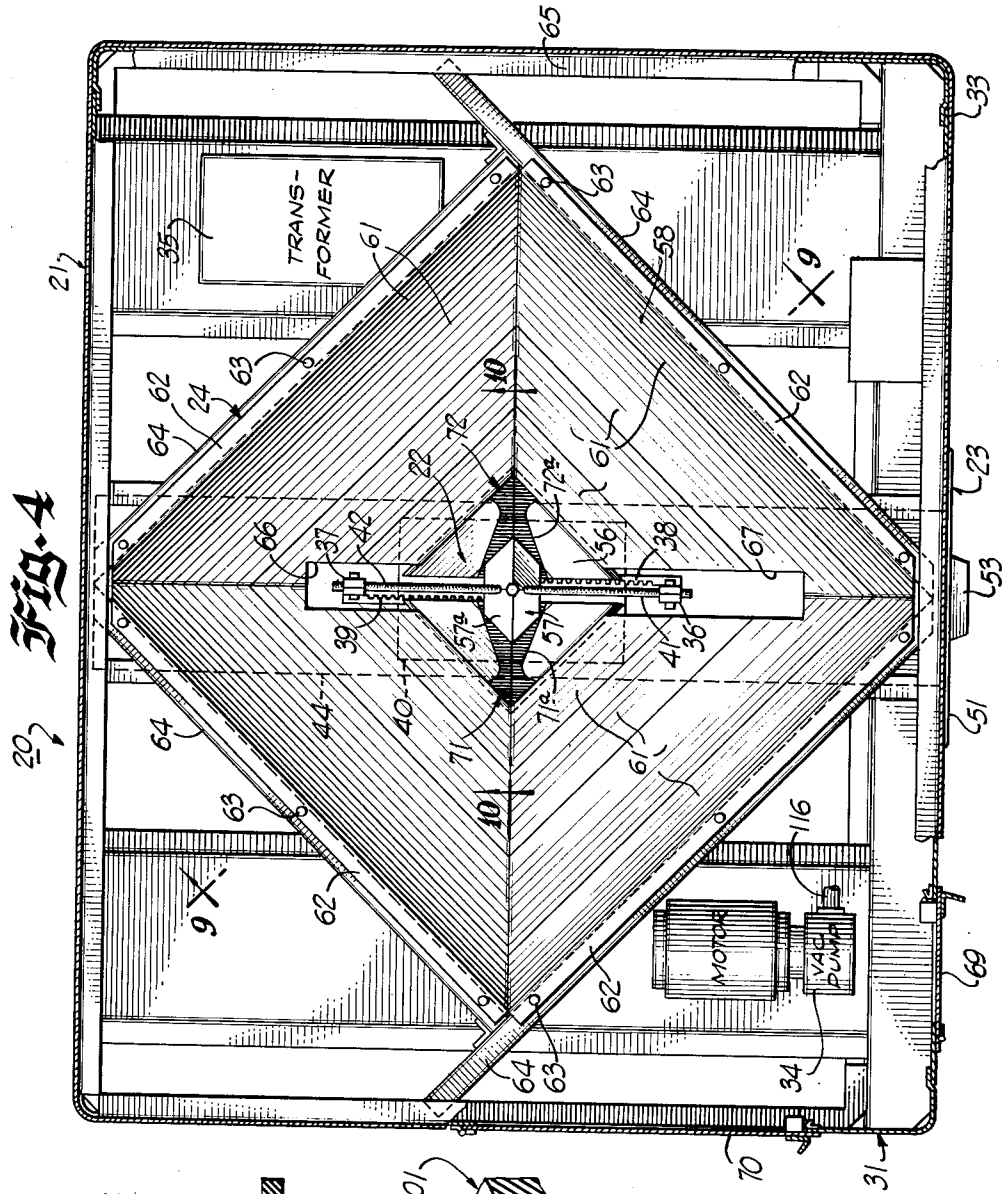


Fig. 4

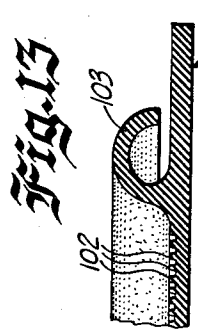


Fig. 13

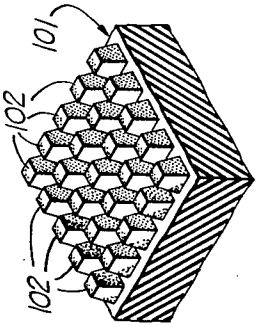


Fig. 14

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PHOTOGRAPHIC PRINTER

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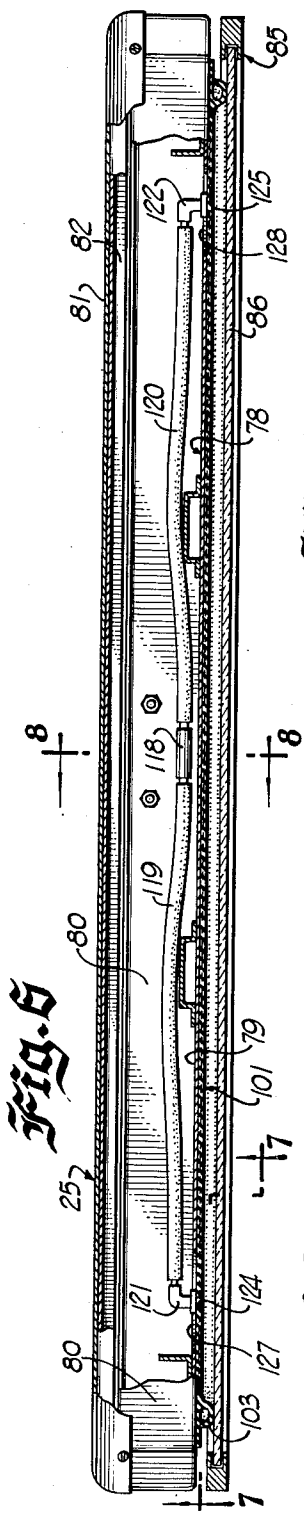


Fig. 6

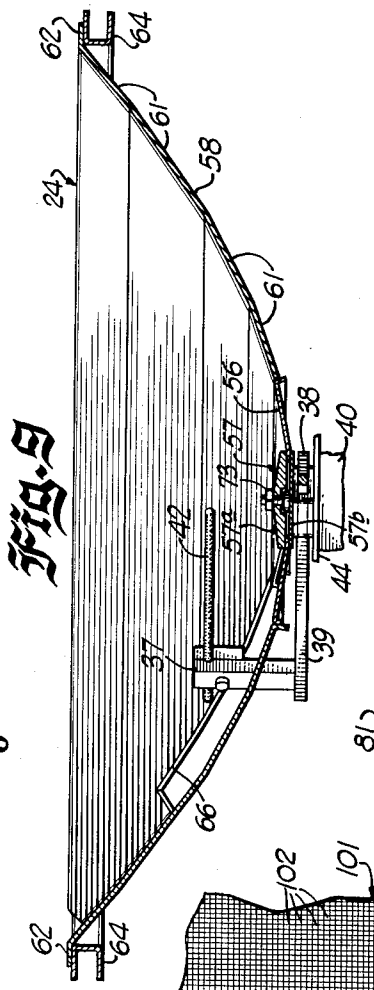


Fig. 9

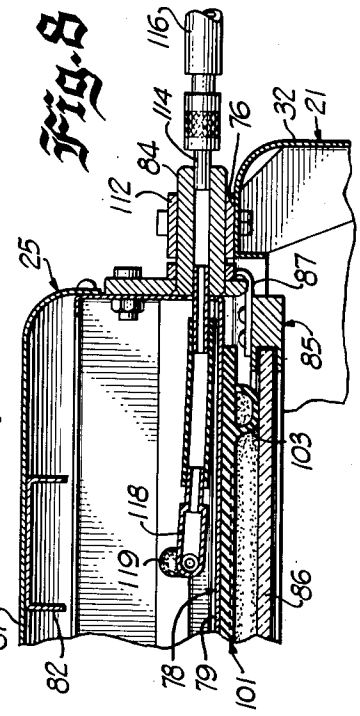


Fig. 8

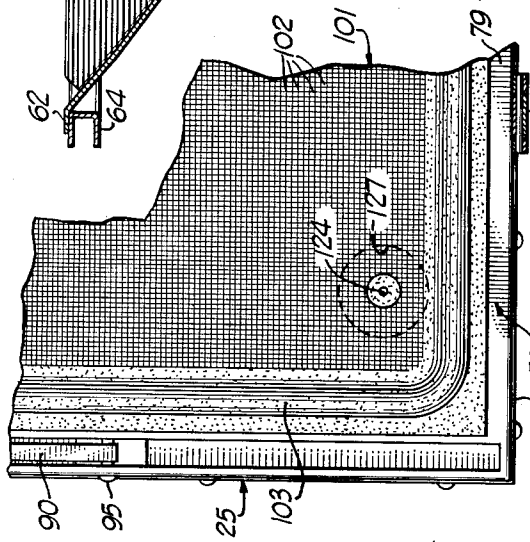


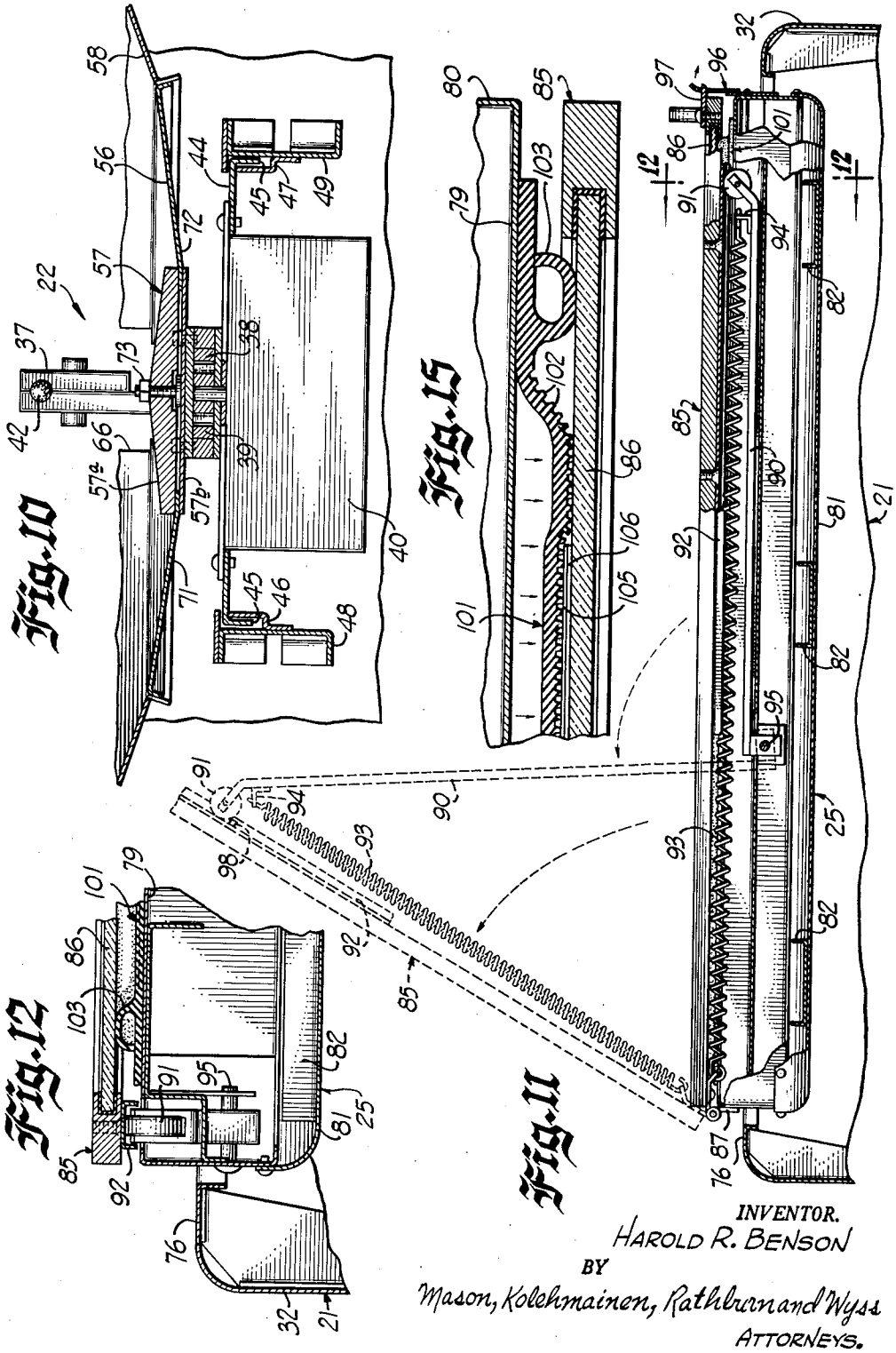
Fig. 7

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PHOTOGRAPHIC PRINTER

Filed March 10, 1959 5 Sheets-Sheet 5



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United States Patent Office 3,043,204 Patented July 10, 1962

3,043,204

PHOTOGRAPHIC PRINTER

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Filed Mar. 10, 1959, Ser. No. 798,522
5 Claims. (Cl. 95—76)

The present invention relates to photographic printers, and, more particularly, it relates to contact printing apparatus useful in exposing the sensitized metallic plates in a process for photoengraving offset plates.

In order to photoengrave a metallic plate so that it may be used thereafter to reproduce a work of art or the like, a photographic negative is first made of the work to be reproduced and thereafter a sensitized metal plate is selectively exposed to the pattern of light corresponding to the work of art by interposing the negative between the sensitized surface of the plate and a source of light. Following the exposure of the plate in this manner, the sensitized surface is subjected to an acid etchant which selectively removes the unexposed portions of the sensitized surface thereby to provide what is commonly referred to as an offset printing plate, the surface of the plate having hills and valleys corresponding to the work of art being copied.

An object of the present invention is to provide new and improved apparatus useful in selectively exposing sensitized metal plates in the photoengraving thereof.

Another object of the present invention is to provide a new and improved contact printer for selectively exposing sensitized metal plates.

A further object of the present invention is to provide a new and improved photographic printer which is easy to use and which insures that the sensitized plates are exposed by a pattern of light which exactly corresponds to the pattern on the negative being copied.

Very briefly, the above and further objects are realized in accordance with the present invention by providing a contact printer comprising a cabinet having a carbon arc light source mounted in the cabinet, which in one embodiment may be mounted in a pull-out drawer, and a light reflector fixedly mounted in the cabinet for directing a uniform beam of light toward the top of the cabinet where a printing frame is pivotally mounted about a central axis thereof. Because it is mounted in this manner the frame can be pivoted to one position in which the loading side thereof is toward the light source and in a second position wherein the loading side of the printing frame is toward the top of the cabinet away from the light source. Accordingly, the plate and the negative may be loaded into the frame from the top side thereof and the frame may then be pivoted into the position wherein the plate is exposed to the light source.

Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of the novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a front elevational view of a photographic contact printer embodying the present invention;

FIG. 2 is another front elevational view of the printer of FIG. 1 showing the printing frame thereof in a different position;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged fragmentary sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 3 assuming the entire structure to be shown therein;

FIG. 7 is a fragmentary sectional view, greatly enlarged, taken along the line 7—7 of FIG. 6 assuming that FIG. 6 shows the complete structure;

FIG. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of FIG. 6 assuming FIG. 6 shows the complete structure;

FIG. 9 is a sectional view somewhat enlarged and taken along the line 9—9 of FIG. 4;

FIG. 10 is a sectional view somewhat enlarged and taken along the line 10—10 of FIG. 4;

FIG. 11 is an enlarged end view of the upper portion of the printer shown in FIG. 1 with certain portions thereof removed;

FIG. 12 is an enlarged sectional view taken along the line 12—12 of FIG. 11 assuming the entire device to be shown therein;

FIG. 13 is a sectional view of the peripheral portion of a vacuum blanket embodying certain aspects of the present invention and used in the printer of FIG. 1;

FIG. 14 is a perspective view of a fragmentary portion of a vacuum blanket embodying certain aspects of the present invention; and

FIG. 15 is a fragmentary cross sectional view of a portion of a printing frame embodying certain aspects of the present invention and used in the printer of FIG. 1.

Briefly, and as best shown in FIGS. 1, 3, and 4 of the drawings, there is provided in accordance with the present invention a photographic printer 20 comprising a generally rectangular cabinet 21 having an automatically operated carbon arc light source 22 mounted in the bottom of the cabinet 21. Although in some embodiments of the present invention the carbon arc light source may be suitably supported within the cabinet 21 in a relatively fixed manner, in the illustrated embodiment this light source is mounted on a pull-out drawer 23. Also included in the cabinet is a generally parabolic reflector 24 including a pyramid-like member for directing the light from the source 22 in a beam of uniform intensity throughout a predetermined area toward a printing frame 25 pivotally mounted about a central axis thereof to the top of the cabinet 21. The bottom of the frame 25, as shown in FIG. 1, comprises a loading station and the top of the frame 25, as shown in FIG. 1, comprises an imperforate protective cover. Accordingly, in order to place a sensitized plate and negative in the frame 25 for exposure by the light from the light source 22, the frame 25 is pivoted as shown in FIG. 2 through 180 degrees so that the loading station is at the top and the protective cover is at the bottom. The frame 25 may then be loaded from the top, and after this has been done it is again rotated through 180 degrees so that the loading station again faces toward the light source 22. Following this, the light source 22 is energized for a predetermined period of time to properly expose the sensitized plate with a light pattern corresponding to the light and dark areas of the negative being copied. Upon completion of the exposure operation, the light source 22 is deenergized and the printing frame 25 is rotated through 180 degrees to permit removal therefrom of the exposed plate and negative.

Where the drawer 23 is provided it will be apparent, that whenever it becomes necessary to change the carbon electrodes of the light source 22 or to remove the ash which collects therein during operation of the printer the drawer 23 may be withdrawn from the cabinet 25. In this way, maintenance of the printer 20 and particularly the light source 22 is a very simple, fast and clean operation.

The cabinet 21 may have a variety of constructions and in the illustrated embodiment is suitably constructed of sheet metal comprising a relatively short bottom portion 31 and a taller top portion 32 which is separate from the bottom portion 21 and is held in place thereon by means of a depending peripheral flange 33 which is suitably welded to the upper cabinet part 32. As shown best in FIG. 4, the lower cabinet portion 31 houses the carbon arc light source assembly 22, the reflector 24, and a plurality of other control components including a motor driven vacuum pump 34 and a power transformer 35. In other embodiments, the cabinet may be of one-piece construction with doors affording access to the reflector, pump, etc.

The carbon arc light source 22 is preferably of the type disclosed in Patent 2,774,907—Benson which is assigned to the same assignee as the present application, and a detailed description of it is given in that patent. However, for the purpose of understanding the present invention a brief description thereof is sufficient. As shown best in FIGS. 3, 4, and 10, the light source 22 comprises a pair of electrode supports 36 and 37 which are respectively mounted on a pair of racks 38 and 39. The racks 38 and 39 are movable toward and away from one another and are suitably driven by a control solenoid and spring mechanism (not shown) housed in a control box 40 for automatically maintaining a pair of carbon electrodes 41 and 42 which are mounted in the supports 36 and 37 at the necessary distance apart to provide a uniform predetermined intensity of light. As best shown in FIG. 10, the movable parts of the light source 22 are mounted on top of the control box 40 which in the illustrated embodiment involving the drawer 23 in turn is suitably secured to a supporting plate 44 having a pair of depending guide flanges 45 (FIG. 10) received in a pair of guide channels 46 and 47. The channels 46 and 47 are respectively mounted on a pair of supporting channels 48 and 49 which are fixedly mounted near the bottom of the lower cabinet portion 31 and extend from front to back thereof. The front of the drawer 23 comprises a face plate 51 which is suitably secured as by welding to the front end of the plate 44, and inasmuch as a toe space is provided along the bottom of the cabinet 21, the face of the drawer 23 is undercut and a second face plate 52 is secured to the bottom of the plate 44 and depends therefrom to cover the undercut face portion of the drawer 23. An angulated handle 53 is secured to the face plate 51 to facilitate opening of the drawer 23.

During operation of the carbon arc light source 22, a certain amount of ash is produced, and in the illustrated construction the ash collects in a tray 56 which is located directly below the electrodes 41 and 42. Therefore, in order to facilitate removal of this ash from the reflector, the tray 56, which constitutes the lower central portion of the reflector 24 and which is best shown in FIG. 10, is suitably secured by means of an attachment assembly 57 to the top of the control box 40 and is thus slidably connected to the remaining peripheral portion of the reflector 24, designated 58. Consequently, when the drawer 23 is withdrawn from the cabinet 21, the tray 56 at the lower central portion of the reflector 24 is withdrawn and any ash which has been deposited thereon may be readily removed.

In order uniformly to direct the light from the arc, which is positioned between the tips of the electrodes 41 and 42, onto the printing frame 25, the reflector 24, which is square when veiwed in plan, has a substantially parabolic cross sectional configuration as best shown in FIG. 9 of the drawings. For the illustrated embodiment, the upper part of the reflector 24 is formed of a plurality of flat strips 61 which are each so oriented that light rays from the arc which strike the inner edge thereof are directed to a location slightly displaced from the center of the printing frame 25 while light rays from the arc which strike the outer edges of the strips 61 are directed to the outer edges of the printing frame. The upper ones of the strips 61 are off-turned at the upper edges thereof to provide a plurality of mounting flanges 62 which are secured by suitable fastening means such as bolts 63 to a plurality of channel supporting members 64 which are secured to inwardly directed peripheral flanges 65 at the top of the lower cabinet portion 31. Accordingly, the upper portion of the reflector 24 is fixedly mounted in the bottom of the cabinet. It includes a pair of elongated slots 66 and 67, best shown in FIGS. 3 and 4, to permit passage of the electrode holders 36 and 37 through the lower portions of the reflector 24 as the drawer 23 is withdrawn and to accommodate the electrode holders 36 and 37 when they are most widely spaced apart at the time that new carbon electrodes 41 and 42 are supported therein.

As can best be seen in FIG. 4, the tray 56 is substantially square in plan being formed of a pair of triangular plates 71 and 72 which, as best shown in FIG. 10, are sandwiched between a pair of connector parts 57*a* and 57*b* together to compress the plates 71 and 72 therebetween, and the part 57*b* is fixedly connected by suitable means to the top of the control box 40. Since the arc is not a point source of light, the reflector 24 must be designed to compensate for the peculiar shape of the arc. Consequently, the diagonal formed by the central surface portions 71*a* and 72*a* of the tray 56 is blackened as by carbonizing to provide a substantially nonreflecting surface.

The bottom cabinet portion 31 of the illustrated embodiment further includes a plurality of access doors 68, 69, and 70 which facilitate maintenance of the vacuum pump and associated motor 34 and the transformer 35.

The upper cabinet portion 32 is a bottomless rectangular member suitably formed of sheet metal and has an inwardly directed peripheral flange 75 at the bottom thereof which rests on the flange 65 of the bottom portion 31, and it further includes an inwardly directed peripheral flange 76 at the top thereof on which the printing frame 25 is mounted. As best shown in FIGS. 1, 3, and 6, the printing frame 25 is relatively thin and substantially rectangular in construction, including as its principal structural element a somewhat cup-shaped member 78 having a flat bottom portion 79 and four side walls 80 to the upper ends of which an imperforate, sheet metal cover 81 is attached. Since the cover 81 is preferably a stamping, a plurality of channel-shaped rigidifying ribs 82 are welded to the inner face thereof. The printing frame will have various sizes depending upon the particular application.

The printing frame 25 is pivotally mounted by means of a pair of pintles 83 and 84 journaled in a pair of bearings 112 which are mounted on the flange 76. The pintles 83 and 84 are coaxially mounted along a central axis of the frame 25 so that the opening in the top of the cabinet 21 is completely covered by the frame 25 in either of two positions, i.e., a loading or an exposure position.

Referring to FIG. 11, a glass frame assembly 85, which includes a plate glass pane 86, is in the illustrated embodiment of the invention pivotally attached to the rear side of the frame 25 by means of a plurality of hinges 87 which are suitably secured to the rear wall 80 of the member 78 and to the glass frame assembly 85. As indicated hereinbefore, during the loading operation, the frame 25 is inverted to the position shown in FIG. 11 and in order to place the negative and the sensitized plate in the frame, the glass frame 85 is pivoted upwardly to the position shown in phantom in FIG. 11. In other embodiments of the present invention, where a very large printing frame is employed, the glass frame 85 instead of being pivotally supported may bodily be raised and lowered while disposed in a horizontal plane.

For the purpose of facilitating the lifting of the glass frame assembly 85 into the position shown in FIG. 11, and to automatically retain it in that position while the frame is being loaded, there is provided in accordance with the present invention a spring lift assembly. It comprises as its principal components a plurality of lift arms 90 which are respectively located at the side edges of the printing frame 85 and which respectively include a guide roller 91 which rides in a track formed in guide channels 92 suitably secured to the respective edges of the frame 85. One end of a helical tension spring 93 is secured by a bracket 94 to a point in the arm 90 in close proximity to the roller 91 and the other end of the spring 93 is secured to the portion of the hinge 87 which is secured to the glass frame 85. In addition, the end of the arm 90 which is remote from the roller 91 is pivotally secured to the cup-shaped member 78 by means of a pintle 95. Considering the operation of the spring lift assembly very briefly, with the glass frame 85 in the down position, the springs 93 are stretched, and inasmuch as both ends thereof are below the pivotal axis of the hinges 87, the spring 93 exerts a downward force on the glass frame 85 to keep it closed. Nevertheless, in order to further insure that the frame 85 does not pivot on the hinges 87 when the frame is inverted to the exposing position as shown in FIGS. 1 and 6, one or more latches 96 are secured to the member 78 and engage associated members 97 on the glass frame 85.

In order to raise the glass frame 85 to load the printing frame 25, the latch or latches 96 are released and the glass frame 85 is lifted upwardly. When the rollers 91 are raised above the pivotal axis of the hinges 87, the springs 93 exert an upward force on the glass frame 85 and thus aid in lifting it. A pair of stops 98 are respectively provided in the guide channels 92 for engaging the rollers 91 when the glass frame 85 is in the phantom position shown in FIG. 11 thereby to permit loading of the printing frame 25. When the glass frame 85 is in this position, the spring 93 is slightly stretched so as to exert a counterclockwise torque on the arm 90 as viewed in FIG. 11 and thus hold the glass frame 85 in the elevated position.

With the glass frame 85 in the elevated position, the glass plate engaging surface of a resilient vacuum blanket 101, which rests on the face of the bottom 79 of the member 78, is exposed and a sensitized plate may be placed thereon. The blanket 101 is preferably a one-piece molding of rubber and, as best shown in FIG. 14, has a plate engaging face which comprises a plurality of square, truncated pyramids or protuberances 102. As best shown in FIGS. 3, 6, 7 and 13, the blanket 101 further includes a peripheral sealing portion 103 for engaging the glass 86 when the glass frame 85 is in a latched position thereby to hermetically seal the cavity defined by the glass pane 86 and the blanket 101. The seal 103 consists of a generally arcuate bead which is compressed into a generally tubular shape when the glass frame 85 is in a latched position. Since the blanket is formed of a resilient material, the inherent resiliency of the sealing bead 103 urges it against the glass pane to provide the desired seal.

With the printing frame 25 in a loading condition as shown in FIG. 11, the glass frame 85 being in the elevated position shown in phantom in FIG. 11, a sensitized metal plate 105 (FIG. 15) is laid on the blanket 101 thereby to be supported by the protuberances 102. The sensitized surface of the plate faces up at this time and a negative 106 to be copied is placed on top of the plate 105, in the manner shown in FIG. 15. The glass frame 85 is then lowered by merely pulling it down so as to cause the roller 91 to roll along the guide rail 92 until the frame is in the full line position shown in FIG. 11 wherein the latch 96 automatically engages the part 97 to compress the sealing bead 103 and hold the frame 85 in a closed position. A suitable vacuum control switch 107 (FIG. 1) located on a control panel 108 at the top front of the cabinet 21 is then actuated to energize the vacuum pump 34 which draws a vacuum between the glass pane 86 and the blanket 101 whereby, as best shown in FIG. 15, the resilient blanket 101 is forced by atmospheric pressure toward the glass pane 86 thereby to firmly press the plate 105 and the negative 106 together and against the inner face of the glass pane 86. Accordingly, relative movement between the plate 105 and the negative 106 is prevented, and more importantly, no air pockets are provided between the two which would, of course, result in distortion of the image projected on the sensitized surface of the plate 105.

In order to connect the vacuum pump 34 to the cavity between the glass pane 86 and the blanket 101, the pintle 84 is tubular and a connecting tube 114 extends into it. The outside end of the tube 114 is connected to the vacuum pump by means of a flexible conduit 116 and the inside end of the tube 114 is connected to a T junction 118. The T junction 118 is disposed within the frame 25 and the two outlets thereof are connected through a pair of respective flexible conduits 119 and 120 to a pair of elbow connectors 121 and 122. The connectors 121 and 122 are tightly fitted in suitable apertures 124 and 125 provided in the blanket 101. Accordingly, the pump 34 draws air from the space between the blanket 101 and the glass pane 86. A pair of enlarged apertures 127 and 128 are provided in the bottom member 79 in the vicinity of the apertures 124 and 125 to provide a large area connection between the back side of the blanket 101 and the atmosphere so that when a vacuum is drawn between the blanket 101 and the glass pane 86, atmospheric pressure is coupled through the enlarged apertures 127 and 128 to the back side of the blanket 101 to press it firmly against the glass pane 86.

In order to lock the printing frame 25 in an exposure position with the glass pane 86 facing toward the light source 22, there is provided a spring-loaded manually operable latch 142 (FIG. 5) including a plunger-type bolt 143 which is biased by a spring 147 into an aperture in a latching member 144. The member 144 is attached to the front wall 80 of the printing frame 25, and in order to release the printing frame 25 for rotation thereof to the loading position, a knob 145 which is threadedly attached to the bolt 143 is pulled out to withdraw the bolt 143 from the aperture in the member 144 and thereby to release the frame 25. A similar latching member 144 may be provided on the opposite side of the printing frame 25 so that the latch 142 may also be used to lock the frame 25 in the inverted, loading position.

The control panel 108 is mounted on the top of a forwardly extending louvered air inlet member 130 which extends along the front of the upper cabinet portion 32 for supplying air through a plurality of apertures 131 in the forward wall of the upper cabinet portion 32 into the space between the light source 22 and the printing frame 25. An exhaust fan or blower 132 is mounted over a large aperture 133 in the back wall of the upper cabinet portion 32 for drawing heat and carbon smoke out of the cabinet 21 during operation of the printer. A plurality of angulated baffles 134 are respectively mounted above the apertures 131 to deflect the air which is drawn into the cabinet through the louvred portion of the member 130 away from the printing frame 25. A baffle 135 is mounted directly above the air outlet aperture 133 for the same purpose.

As indicated hereinbefore, the control panel 108 includes a vacuum pump control switch 107 and it further includes a vacuum pressure gauge 136 and a vacuum adjustment control 137. In addition, a light source control switch 138, a timer control adjustment 139, a blower control adjustment 140, a master control switch 141 and a vacuum release 150 are provided on the panel 108 in easy reach of a person operating the machine.

There is thus provided in accordance with the present invention a photographic printer 20 which may be used by relatively untrained personnel for making accurate exposures of sensitized metal plates of the type used in the photoengraving of offset printing plates. Moreover, the printer 20 is easy to maintain inasmuch as all operating parts are readily accessible and those parts which must be replaced, i.e., the carbon electrodes 41 and 42 may be readily removed from the cabinet in order to make the changing operation extremely simple. Moreover, the ash tray 56 can also be easily removed from the cabinet 21 for cleaning and the other operating parts of the machine such, for example, as the vacuum pump 34 and drive motor, are readily accessible.

While there has been shown and described a particular embodiment of the present invention, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspects, and it is, therefore, contemplated in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A printer for use in making photographic plates and the like, comprising a cabinet, a source of printing light mounted in the lower part of said cabinet for directing light toward the top of said cabinet, a printing frame, mounting means for mounting said frame in the top of said cabinet for pivotal movement about a central axis of said frame thereby to permit the positioning of said frame with either side thereof facing toward said light source, a pump mounted in said cabinet, pressure responsive means disposed in said frame for fixedly positioning a photographic plate or the like in said frame, an apertured pintle included in said mounting means for said frame, and a fluid connection between said pump and said pressure responsive means, said connection including the aperture in said pintle.

2. A printer for use in making photographic plates and the like, comprising a cabinet, a source of light mounted in the lower part of said cabinet, a printing frame including a glass plate and an imperforate resilient blanket disposed in face-to-face relationship with said plate having a continuous seal interposed between a peripheral portion of said plate and said blanket, means for drawing a vacuum between said blanket and said plate, and mounting means for mounting said frame in the top of said cabinet for pivotal movement about a central axis of said frame thereby to permit the positioning of said frame with either side thereto facing toward said light source while maintaining said vacuum.

3. A photographic printer comprising a cabinet having side walls forming an interior cavity and defining an upper opening, said opening communicating with said cavity and having a given configuration, light source and reflector means disposed in the lower end of said cavity for supplying light upwardly through said upper opening, a generally uniplanar printing frame of said given configuration disposed in and substantially closing said upper opening to provide the top of said cabinet, said printing frame including both a transparent plate on one side hinged at one end to said printing frame and holding means for holding a light sensitive sheet adjacent said plate, and mounting means on said side walls for mounting said printing frame for pivotal movement between two positions spaced approximately 180° from each other in which said frame is effective to substantially close said upper opening, said plate being disposed below the top of said cabinet in one of said positions to receive light from said light source and reflector means, said plate forming the top of said cabinet in the other of said positions to permit unobstructed insertion of said sheet spaced from said light source and reflector means.

4. The photographic printer set forth in claim 3 including air inlet means formed in one of said side walls at a position disposed below said printing frame and above said light source and reflector means, said inlet means providing means for supplying air to said cavity, and motor driven exhaust means mounted on another of said side walls opposite said one side wall for exhausting air from said cavity.

5. The photographic printer set forth in claim 3 in which said holding means includes a resilient sealing means, and in which said printer includes a vacuum source in said cavity, and means including said mounting means for connecting said vacuum source to said resilient sealing means.

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