Sept. 29, 1964 A. GERSON 3,150,582

PHOTO OFFSET PLATE MAKING MACHINE

Filed May 19, 1960 4 Sheets-Sheet 1

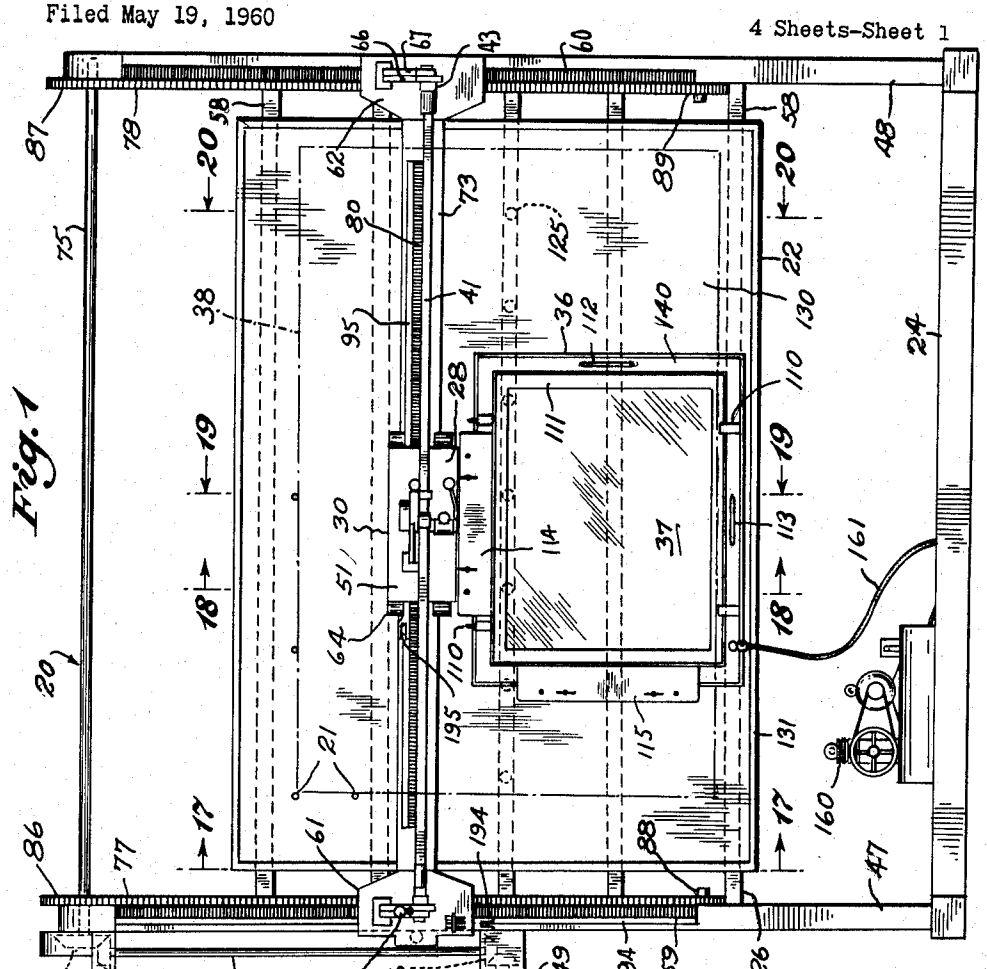

Fig. 1

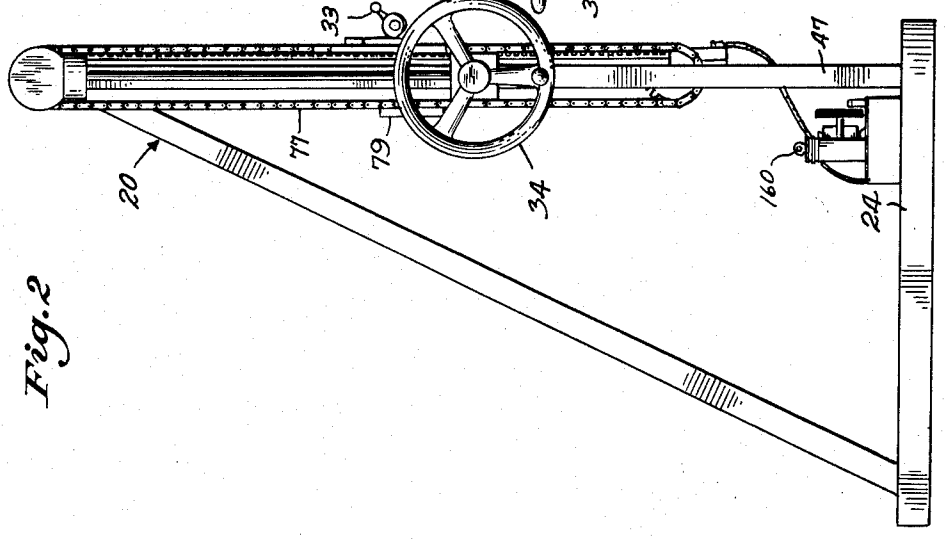

Fig. 2

Sept. 29, 1964 A. GERSON 3,150,582

PHOTO OFFSET PLATE MAKING MACHINE

Filed May 19, 1960 4 Sheets-Sheet 2

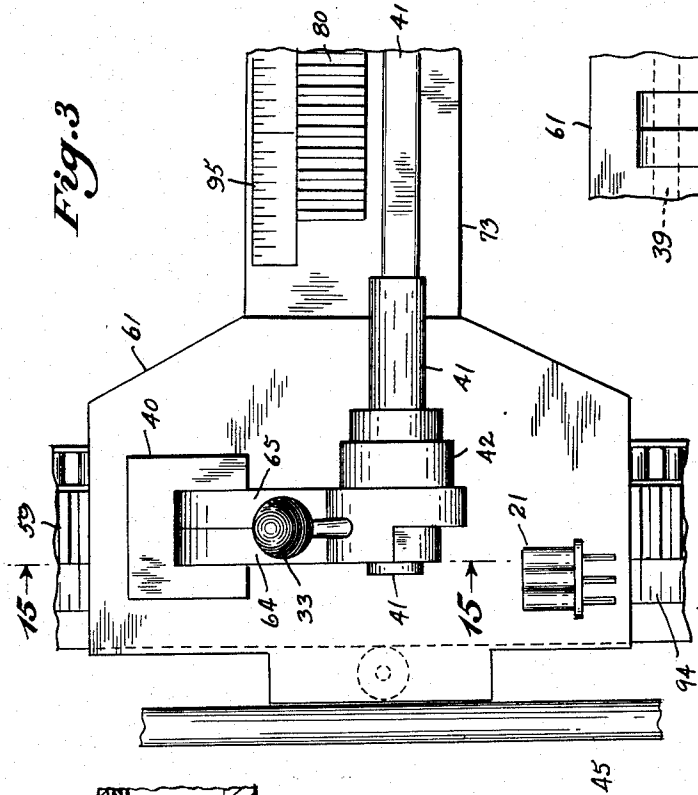

Fig. 3

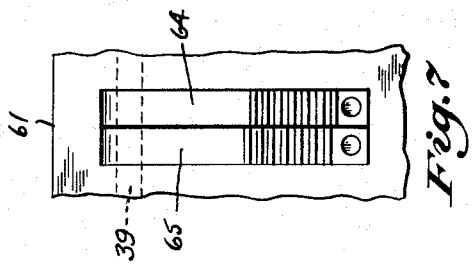

Fig. 7

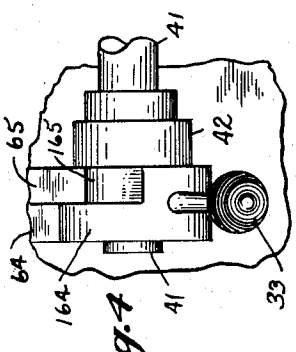

Fig. 4

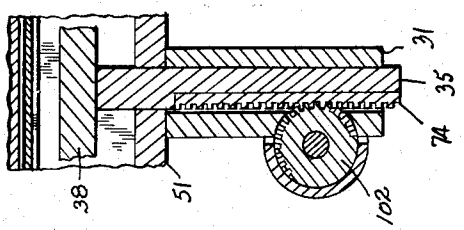

Fig. 8

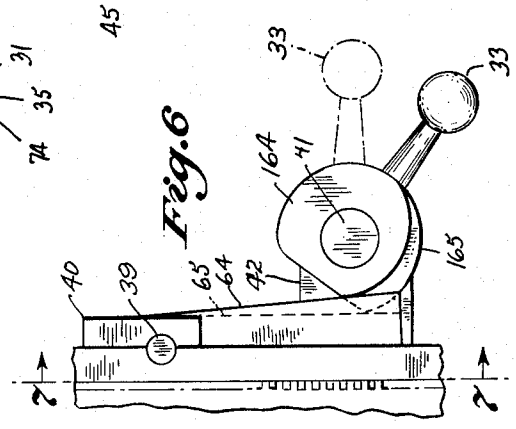

Fig. 6

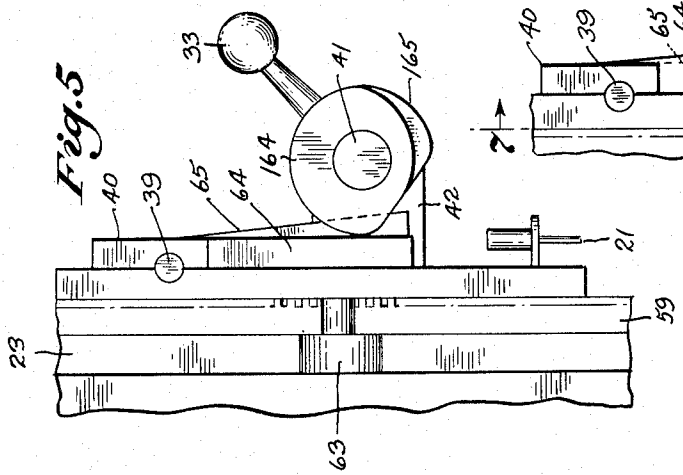

Fig. 5

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PHOTO OFFSET PLATE MAKING MACHINE

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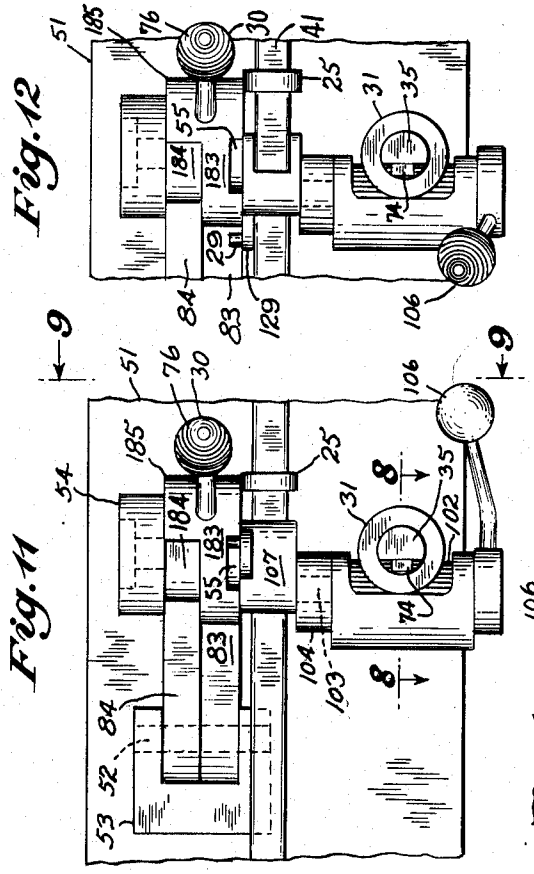
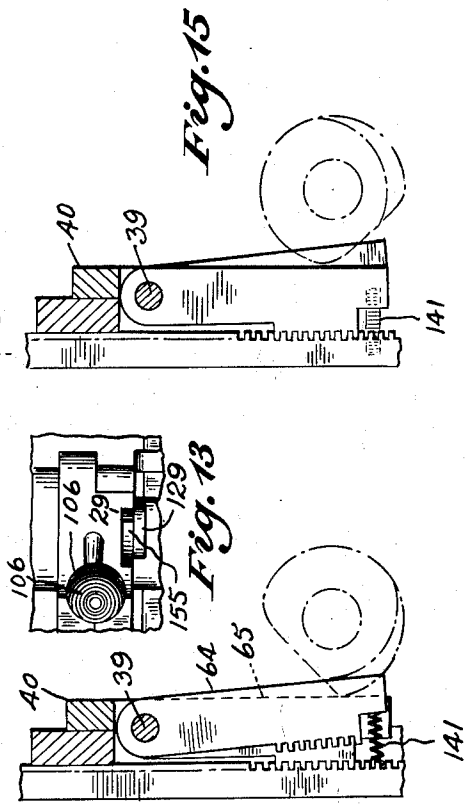
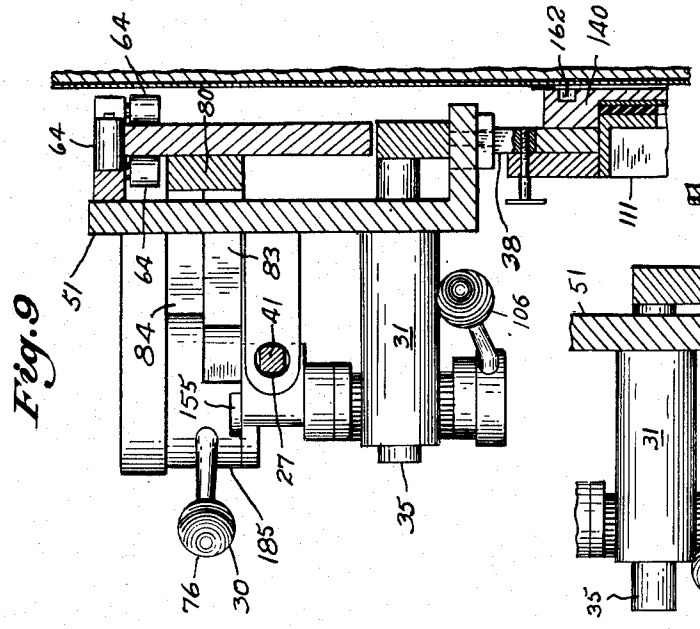
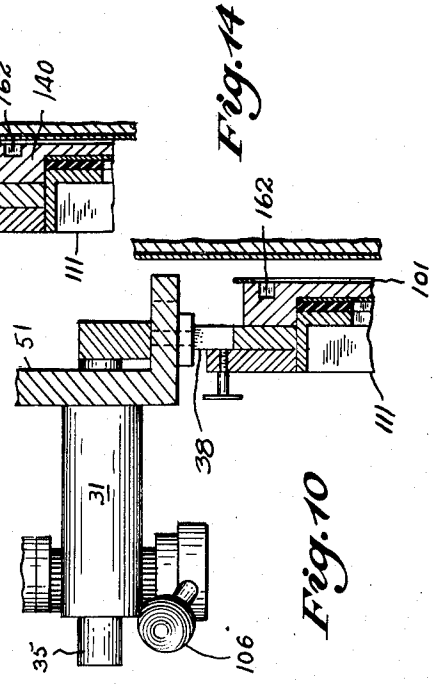








Sept. 29, 1964 A. GERSON 3,150,582

PHOTO OFFSET PLATE MAKING MACHINE

Filed May 19, 1960 4 Sheets-Sheet 4

Fig. 16

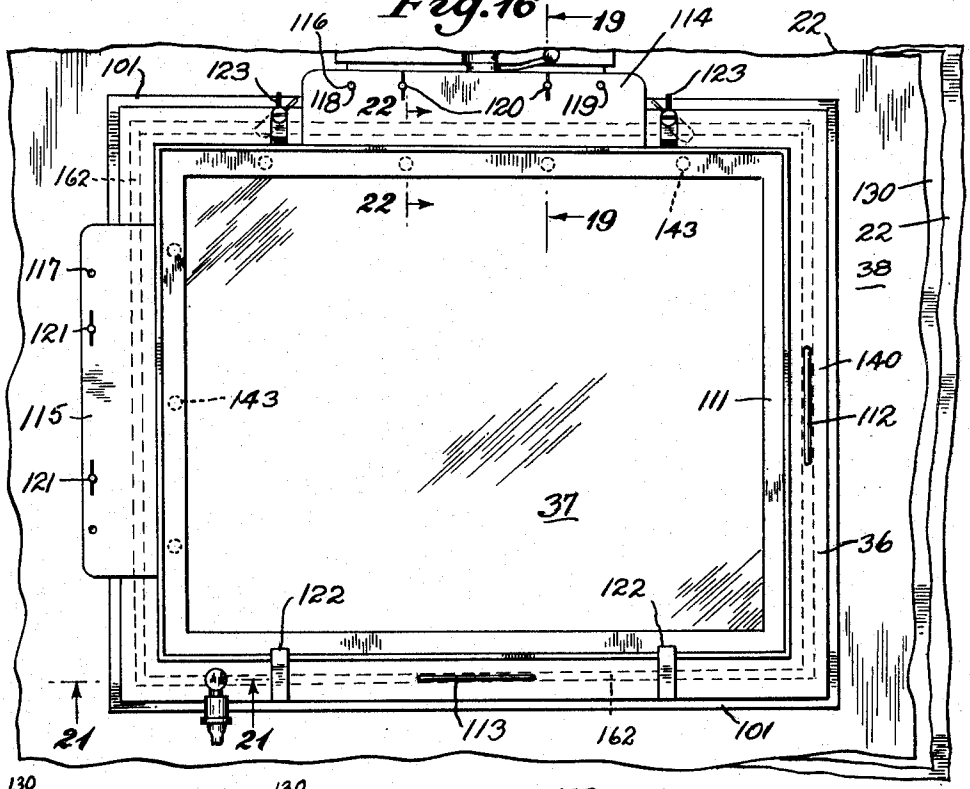


Fig. 17

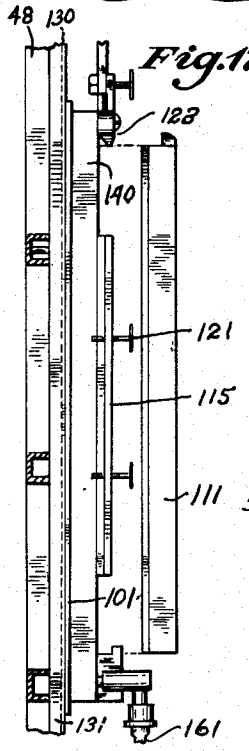


Fig. 18

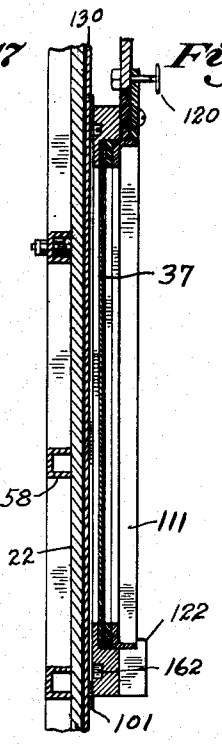


Fig. 19

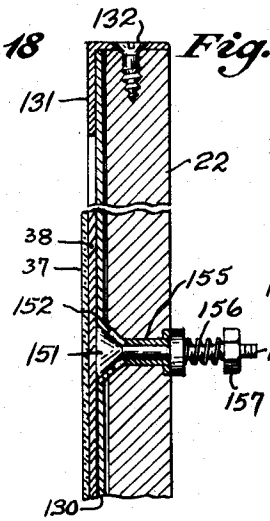


Fig. 20

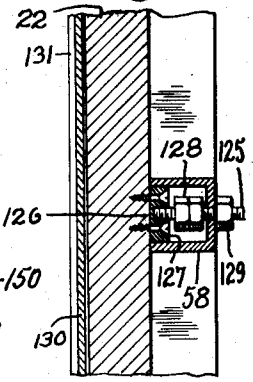


Fig. 21

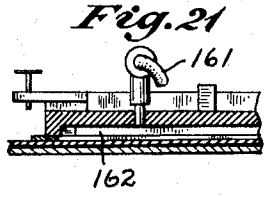
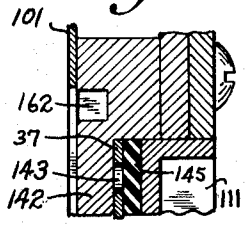


Fig. 22



United States Patent Office 3,150,582 Patented Sept. 29, 1964

3,150,582

PHOTO OFFSET PLATE MAKING MACHINE

Albert Gerson, Yorktown Heights, N.Y. (% Gerson Offset Co., 333 Hudson St., New York, N.Y.)

Filed May 19, 1960, Ser. No. 30,113
4 Claims. (Cl. 95—76)

This invention relates generally to the art of making plates used in photo-offset lithography printing and more particularly to a machine especially useful for multi-plate printing and color work.

In the photolithographic process, it is frequently desirable to have multiple images in spaced and predetermined positions on the photolithographic plate, which images are obtained by repetitive exposure. Certain economies result from the production of a number of identical reproductions from a single plate impression, and in color work, the number of impressions is equal to the number of colors used. In order to produce work of acceptable high quality, it is necessary that the various color impressions be exactly superimposed. To this end it is necessary that the negatives used to expose the lithographic plate be in precise register and proper contact. While devices of this general character are known, because of the extremely accurate machine work required in their fabrication and their large bulk and weight, such devices are of relatively high cost and the use thereof is consequently restricted. In addition, the systems employed in prior art machines are complicated and require considerable training before the operator is capable of producing satisfactory work.

It is therefore among the principal objects of the present invention to provide an improved machine of the character described wherein certain of the components used enable the precise registering of the negatives, with respect to the lithographic plate, obtained by using novel structure and precise parts which are commercially available in quantity at relatively lower costs.

Another object herein lies in the provision of a lithographic plate support which although light in weight may present a slightly flexible substantially planar surface, but which nevertheless will permit air movements during exhaustion while the vacuum pump is operating so that proper sealing and contact may be obtained.

Another object herein lies in the provision of a negative carrier support which is adjustable in two directions disposed at 90 degrees with respect to each other and in which registering means assure precise alignment and return to predetermined positions as selected by the user.

Another object of the present invention lies in the provision of structure for the adjustable positioning of the negative carrier support, which affords very rapid and convenient shifting and positioning of said support and quick precise selection of fine space intervals both vertically and horizontally by the mere flicking of two shift levers.

Another object herein lies in the provision of a chase having a resilient edge for airtight contact with the plate support and automatic means to prevent scuffing or scrubbing of the resilient edge when the chase is shifted.

A further object of the present invention lies in the provision of improved chase construction.

Another object herein lies in the provision of new and useful lithographic plate support construction adapted to provide full contact between the negative and the plate.

A feature of the invention is the provision of lithographic plate keying pins for precise plate location, and the location of the base point at one side of the plate support rather than at the center of the machine.

These objects and other incidental ends and advantages will more fully appear in the progress of this disclosure and be pointed out in the appended claims.

In the drawings in which similar reference characters designate corresponding parts throughout the several views:

FIGURE 1 is a front elevational view of a preferred embodiment of the invention.

FIGURE 2 is a side elevational view as seen from the left of FIGURE 1.

FIGURE 3 is an enlarged fragmentary detail elevation of a left hand portion of FIGURE 1 showing the vertical shift lever and associated parts.

FIGURE 4 is a fragmentary elevation corresponding to FIGURE 3 but showing the vertical shift lever in an altered position thereof.

FIGURE 5 is an end elevation of FIGURE 3 as seen from the left thereof.

FIGURE 6 is an end elevation of FIGURE 4 as seen from the left thereof.

FIGURE 7 is an elevation as seen from the plane 7—7 on FIGURE 6.

FIGURE 8 is a sectional view as seen from the plane 8—8 on FIGURE 11.

FIGURE 9 is a fragmentary enlarged detail sectional view as seen from the plane 9—9 on FIGURE 16.

FIGURE 10 is a fragmentary vertical sectional view corresponding to FIGURE 9 but showing the chase shifting lever in an altered position thereof.

FIGURE 11 is an enlarged fragmentary detail elevational view of FIGURE 1 showing the horizontal shift lever and the chase shifting lever and associated parts.

FIGURE 12 is a fragmentary elevation corresponding to FIGURE 11 but showing the chase shifting lever in an altered position.

FIGURE 13 is a fragmentary elevation corresponding to FIGURE 11 but showing the horizontal shift lever in an altered position.

FIGURE 14 is a sectional view corresponding to FIGURE 15 with the vertical shift lever in an altered position.

FIGURE 15 is a sectional view as seen from the plane 15—15 on FIGURE 3.

FIGURE 16 is an enlarged fragmentary detail front elevational view of the central portion of FIGURE 1.

FIGURE 17 is an enlarged fragmentary sectional view as seen from the plane 17—17 on FIGURE 1.

FIGURE 18 is an enlarged fragmentary detail sectional view as seen from the plane 18—18 on FIGURE 1.

FIGURE 19 is an enlarged fragmentary detail sectional view as seen from the plane 19—19 on FIGURE 1.

FIGURE 20 is an enlarged fragmentary detail sectional view as seen from the plane 20—20 on FIGURE 1.

FIGURE 21 is an enlarged detail fragmentary sectional view as seen from the plane 21—21 on FIGURE 16.

FIGURE 22 is an enlarged fragmentary sectional view as seen from the plane 22—22 on FIGURE 16.

In accordance with the invention, the machine, generally indicated by reference character 20 may comprise broadly: a lithographic plate support element 22, lithographic plate registering means 21, a base 24, mounting means 26 for positioning the support element 22, a negative carrier support 28, substantially horizontally registering means 30, substantially vertical registering means 32, and means 34 to vertically move the horizontal registering means.

It will be understood by those skilled in the art to which the present invention relates, that the same may have included therewith a chase or negative carrier 36, a negative 37, a lithographic plate 38, and a suitable source of illumination (not shown).

The base 24 is preferably possessed of sufficient weight and rigidity to form a stable foundation for the machine 20. Projecting perpendicularly up from base 24 are a pair of uprights 47 and 48. Secured between the uprights 47 and 48 are a plurality of struts 58 forming the means 26, to which the support element 22 is secured.

The vertical registering means 32 includes a pair of racks 59 and 60 which are substantially identical and are in horizontal alignment. Slidably disposed upon said racks are a pair of housings 61 and 62 and, as shown in FIGURE 5 they may have rollers 63 which ride within the channels 23. Overlying the racks 59 and 60 are short rack sections 64, 65, 66, and 67 which are completely complementary to the racks 59 and 60 so that with relatively light pressure, the rack sections 64 and 66 or 65 and 67 will properly and alignedly seat or mesh with said racks. The rack sections 64 and 66 or 65 and 67 are moved toward and away from the racks 59 and 60 by structure shown generally in FIGURE 1 and since the housings 61 and 62 and their associated structure are substantially identical, a detailed description of one will suffice for the other.

The rack sections 64 and 65 are pivotally mounted on a pin 39 trunnioned in the bearing block 40, and are normally urged to disengaged position by the coil springs 141 (one for each of the rack sections 64 and 65), as shown in FIGURES 14 and 15. Each of the rack sections 64 and 65 acts as a follower for its respective cams 164 and 165 which are interconnected, provided with vertical shift lever 33 and are keyed to the horizontal shaft 41 journalled in bearings 42 and 43. Bearings 42 and 43 are secured to the housings 61 and 62 respectively. When the lever 33 is in its upward position (FIGURES 1, 2, 3, 5 and 15) rack section 64 is engaged with rack 59; and when lever 33 is in its downward position (FIGURES 4, 6 and 14) rack section 65 is engaged with rack 59. As best seen in FIGURE 7, rack section 64 is downwardly offset by a fine interval (for example 1/16") but not less than one half tooth pitch.

The means 34 serves to provide the coarse adjustment in vertical displacement of the negative carrier support 28 through vertical movement of the housings 61 and 62 as joined by the transverse member 73. The housings 61 and 62 are connected to one point on annular chains 77 and 78 which ride on upper sprockets 86, 87, and lower sprockets 88, 89. A counterweight 79 is mounted on chains 77 and 78. Sprockets 86 and 87 are fixed on transverse shaft 75 journalled in the upper ends of the uprights 47 and 48. One end of shaft 75 is connected by a pair of bevel gears 44 to the vertical shaft 45, in turn connected by a pair of bevel gears 46 to stub shaft 49 and handwheel 134. Thus when the shift lever 33 is in its neutral position (dot-dash lines in FIGURE 6) both rack sections 64 and 65 (and 66 and 67) are disengaged and rotation of handwheel 134 moves transverse member 73, and housings 61 and 62 up or down, to a desired approximate position (as for example to a position within 1/8" of its ultimate position). Moving the shift lever 33 up or down will then force one or the other set of rack sections into the racks 59 and 60 and when the parts are fully interengaged they will be disposed precisely at a predetermined position within the steps which are equal to half the pitch of the racks 59 and 60.

The horizontal registering means 30 comprises a body 51 which is adapted for horizontal travel along the transverse member 73 supported by a plurality of rollers 64, the member 73, serving as a track therefor. Means 30 may be locked in predetermined positions along transverse member 73 by the alternate engagement of one of the rack sections 83 or 84 with rack 80, which is suitably secured to the front surface of the member 73. The rack sections 83 and 84 are pivotally mounted on a pin 52 which is journalled in the bearing 53 mounted on the forward surface of body 51, and are maintained disengaged, or selectively engaged with rack 80 by the cams 183 and 184. Said cams are interconnected or integral with the cam

element 185 from which extends the horizontal shift lever 76. The action and structure of the rack 80 and rack sections 83 and 84 and the cams 183 and 184 is substantially the same as that of the racks 59 and 60 and sections 64, 65, 66, and 67, so that when the lever 76 is in neutral, the body 51 may be manually shifted along the member 73 for an approximate or coarse displacement, and then moving the shift lever 76 right or left of center engages the respective rack sections to get precise horizontal positioning in steps equal to one-half of the pitch of rack 80.

The cam element 185 is journalled in a bearing 54 on axle 56 and element 185 has a pair of recesses 55 and 155. Disposed to the right of a bearing 104 and projecting forward from body 51 is a guide 25 which rides along horizontal shaft 41 (which is polygonal in cross-section as seen in FIGURE 9,) and maintains the slender shaft 41 in predetermined position with respect to body 51. The shaft 41 is so constructed and arranged that it presents a flat surface 27 forwardly when any of the rack sections 64–67, inclusive is fully engaged. So also is cam element 185 and particularly the recesses 55 and 155 of element 185 constructed and arranged so that it is out of the way of the projection 29 when either of the rack sections 83 or 84 is fully engaged with the rack 80. This is to prevent movement of the body 51 in the general plane of the plate support element 22, while the air seal 101 is engaged against the surface of the lithographic plate 38.

Projecting forwardly from the front surface of body 51 is a cylinder 31 which contains a plunger 35 having a rack 74 engaged by gear 102. Gear 102 is keyed to shaft 103, which is journalled in the housing 104. Shaft 103 at its lower end is provided with the negative carrier support shifting lever 106. Thus, movement of lever 106 to the right as viewed in FIGURE 12 will cause it to take the position shown in FIGURE 11, and the plunger 35 will move the support 28 so that the seal 101 contacts element 22, or the lithographic plate 38 if one is in place.

Secured to the upper portion of shaft 103 is a latch 107, and secured to said latch is the projection 29 referred to above. FIGURE 12 shows the unlocked position, here lever 106 is to the left, the seal 101 is spaced forwardly from the support 22 or if there is a lithographic plate 38 in place, then from plate 38. The projection 29 is an upward projecting pin on a short radial arm 129 extending out from the latch 107 which is bifurcated (FIG. 12). Thus if neither of rack sections 83 and 84 is engaged in rack 80, the outer surface of cam element 185 will obstruct projection 29, or if neither of rack sections 64 or 65, or 66 or 67 is engaged in rack 59 or 60, the bifurcated legs of latch 107 will not be able to pass rearward over shaft 41, and the lever 106 cannot be moved to make the seal 101 contact the plate 38, or sheet 130 on element 22.

Turning to FIGURES 1, and 16 to 22, inclusive, the details of the present chase and backboard or lithographic plate structure construction is shown. The negative carrier, generally indicated by reference character 36, includes a main frame 140, and a movable negative holder 111. The negative carrier 36 has means 110 for the detachable engagement of the negative holder 111 by which the negative 37 is pressed upon the flange 142 of said frame 140. The negative holder is preferably of oblong rectangular shape having external dimensions of a size enabling it to be a sliding fit within the main frame 140. In FIGURE 17, the negative holder 111 is shown in a position where it is about to be received by the main frame 140 and in FIGURE 18, the negative holder 111 is shown in a position where it is almost fully seated, and in FIGURE 22 the negative holder 111 is fully seated, pressing the negative 37 against the flange 142 with a series of orifices in the negative 37 engaged by the positioning projections 143. The projections 143 project forwardly from the flange 142 and they are disposed at pre-

determined intervals along the upper portion of the flange **142** and along the lefthand portion of the flange **142**. The arrangement of these projections is indicated in dotted lines in FIGURE 16. The negative **37** is preferably composed of dimensionally stable synthetic resin and of a size to be disposed within the main frame **140**. When the negative **37** has been placed upon the flange **142** with the projections **143** disposed within the correspondingly positioned orifices in the negative, said negative is precisely keyed in location with respect to the other moving parts of the device. Thus, it is a simple matter to substitute other negatives correspondingly punched and with precise registration. A negative mounted on the projections **143** is maintained in its proper position by the negative holder **111** which is provided with an annular cushioning member **145**. The cushioning member may be composed of rubber.

The negative holder **111** is adapted to fit precisely (in a sliding manner) within the frame **140**, and holder **111** is held in position by being placed behind or inwardly of the lugs **122** and the locks **123**. The open position of the locks **123** is shown in dot-dash lines in FIGURE 16. When pivoted to their closed position, they urge the negative holder to compress the member **145** and to precisely position the negative **37**.

The carrier **36** is preferably of oblong rectangular shape and is provided with handles **112** and **113** and with a pair of selectively engageable mounting members **114** and **115**. The members **114** and **115** are provided with a plurality of precisely located holes **116** and **117** respectively which may engage upon the correspondingly positioned pegs **118** and **119**. The carrier **36** is held by pairs of wing bolts **120** and **121** which may threadedly engage the element **36** (see FIGURES 9 and 10). By engaging and disengaging the bolts **120** or **121**, the chase can be used in either of two positions 90° apart.

The lithographic plate support element **22** is adjustable as to flatness by the threaded rods **125**, the inner ends **126** of which are connected to element **22**, by the anchor plates **127**. The outer ends of the rods **125** freely pass through the struts **58**. Adjustment of the nuts **128** and **129** enables the element **22** to be slightly distorted forward or rearward to get it flat. The requirement for absolute flatness is reduced by the use of the following structure.

The element **22** is provided with a thin planar flexible sheet **130** which is preferably spaced, a slight distance (for example 1/16 of an inch forward of the front surface of the element **22**). The sheet **130** is loosely retained in position by a rim **131**, which is secured to the element **22** by the screws **132**.

When air is withdrawn from the space between the negative **37** and the lithographic plate **38**, the sheet **130** can flex slightly to provide complete contact. Excessive forward movement is limited by the structure shown in FIGURE 19, where a bolt **150** has its head **151** engaged in a disked portion **152** of sheet **130**. The element **22** may be provided with a bushing **155** within which the smooth shank of the bolt **150** is slideably disposed. Outward movement of the sheet **130** is inhibited by the helical spring **156**, the spring tension of which may be regulated by the nut **157**.

This construction avoids the necessity for making a relatively large area backboard absolutely planar, and the present construction will act to correct any deviations which occur over a period of time.

In making a lithographic plate, the plate **38** is suitably positioned on the sheet **130** by abutting the top edge and the left side edge against the pins **21** which are placed in the holes therefor (FIGURE 1).

Next the negative **37** is placed so that its holes are engaged by the projections **143** on the flange **142**. The holder **111** is put in place and locked and the suction pump **160** is started. This withdraws air by means of the tube **161** from the channel **162** and as the air is exhausted, atmospheric pressure brings the negative **37** and the plate **38** in contact with each other, the sheet **130** flexing to produce intimate contact over the entire area which is to be exposed. By virtue of the improved construction described, proper contact between negative and plate is obtained at relatively low pressures.

It will be understood, of course, that the pump is not started until the negative is precisely located with respect to the photolithographic plate, and that this location is first obtained in a coarse manner along the scales **94** and **95** which are read from the indicators **194** and **195** connected to the housing **61** and the body **51** respectively; and in a fine manner by manipulation of the levers **33** and **76**.

The expression negative is used to designate not only a true photographic negative, but also any material used to obtain differences in actinic effect on the sensitized surface of the material supported on the photolithographic plate support element.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specfication, for obvious modifications will occur to those skilled in the art to which the invention relates.

I claim:

1. In a photolithographic plate-exposing machine for use with a negative including a photolithographic plate support, a negative carrier support movable in a plane substantially spaced and parallel with respect to said plate support, improved means to adjust the position of the carrier support relative to the plate support including: a rack connected to one of said supports, the other of said supports having pivotal means thereon having a principal axis, first and second rack sections coaxially mounted upon said pivotal means substantially at one end thereof, and being disposed in generally parallel relation; one of said sections being displaced with respect to the other of said sections along a distance of at least one half the rack pitch, and pivotally mounted cam means having an axis of pivotal movement substantially parallel to that of said rack sections, and selectively engageable with said first and second rack sections to move the same into engagement with said rack.

2. In a photolithographic plate-exposing machine for use with a negative including a photolithographic plate support, a negative carrier support movable in a plane substantially spaced and parallel with respect to said plate support, improved location means for fixing the position of the carrier support in said plane; said carrier support being movable in a second plane toward and away from said plate support; means for moving the negative carrier support with respect to said plate support; and interlocking means to permit actuation of said means for moving the negative carrier support toward and away from said plate support only when said location means is actively immobilizing said negative carrier against movement in said first-mentioned plane.

3. In a photolithographic plate-exposing machine for use with a negative, and including a photolithographic plate support and a negative carrier support movable in a plane substantially spaced and parallel with respect to said plate support, the improvement comprising: means to adjust the position of the carrier support relative to the plate support including a rack connected to one of said supports, the other of said supports having pivotal means thereon, first and second rack sections mounted on said pivotal means, a shaft, cam means mounted upon said shaft and selectively moving against one of said rack sections to engage the same with said rack, said shaft having a non-circular cross section including a planar surface longitudinally arranged thereon, a latch member having a projection thereon, movement of said latch member serving to move said negative carrier support with respect to said plate support, movement of said cam means to engage one of said rack sections serving to po-

sition said shaft to clear said projection on said latch member.

4. In a photolithographic plate-exposing machine for use with a negative, and including a photolithographic plate support and a negative carrier support movable in a plane substantially spaced and parallel with respect to said plate support, the improvement comprising: means to adjust the position of the carrier support relative to the plate support including a rack connected to one of said supports, the other of said supports having pivotal means thereon, first and second rack sections mounted on said pivotal means, a shaft, cam means mounted upon said shaft and selectively moving against one of said rack sections to engage the same with said rack, said shaft having a non-circular cross section including a planar surface longitudinally arranged thereon, a latch member having a projection thereon, movement of said latch member serving to move said negative carrier support with respect to said plate support, movement of said cam means to engage one of said rack sections serving to position said shaft to clear said projection on said latch member; a second cam means for locking said plate support, said cam means having a recess therein, movement of said second cam means to locking position serving to position said recess to clear said projection.

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