

Nov. 21, 1967

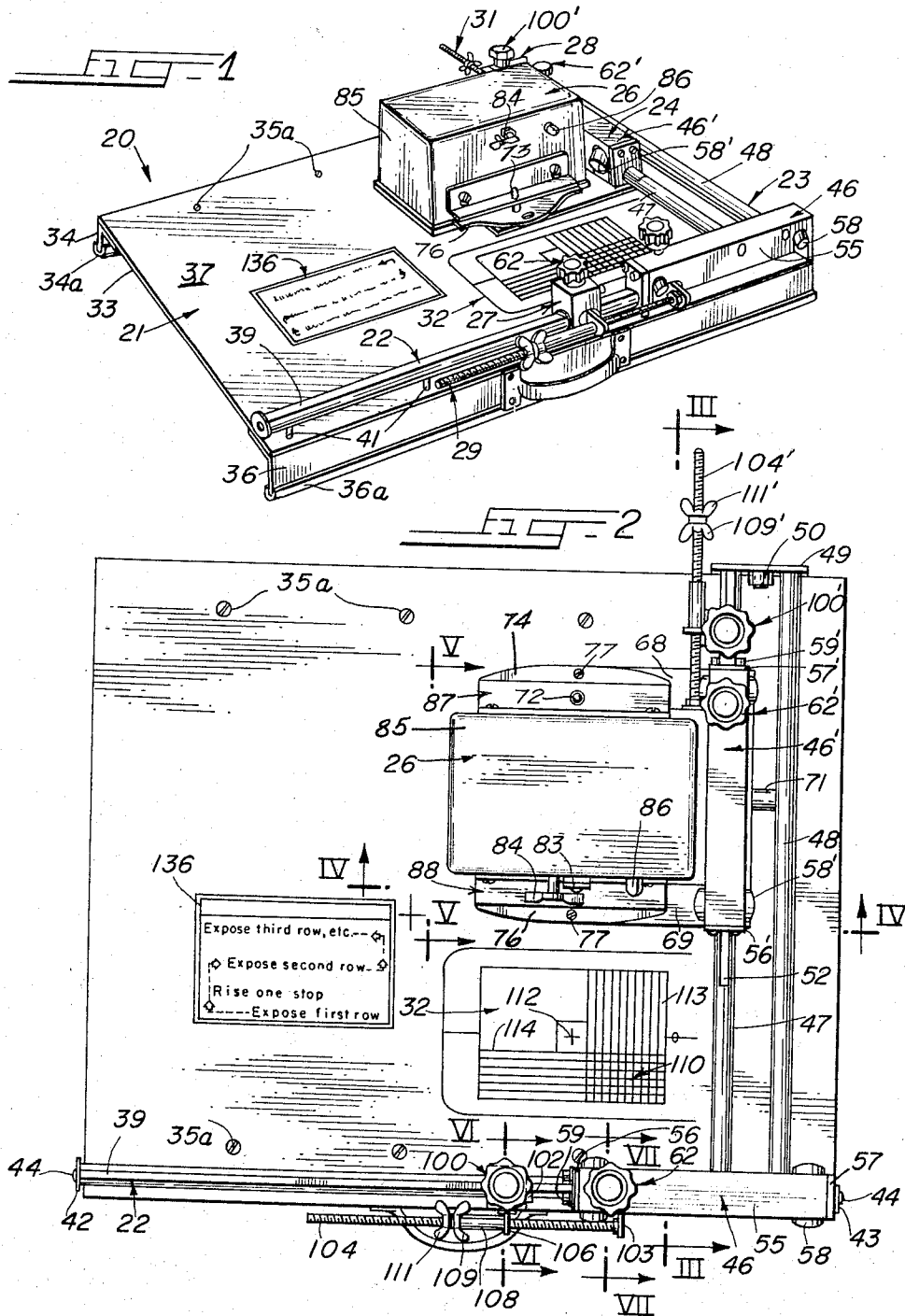
L. V. GROVER

3,353,469

MULTIPLE CONTACT PRINTING MACHINE

Filed Oct. 7, 1964

4 Sheets-Sheet 1



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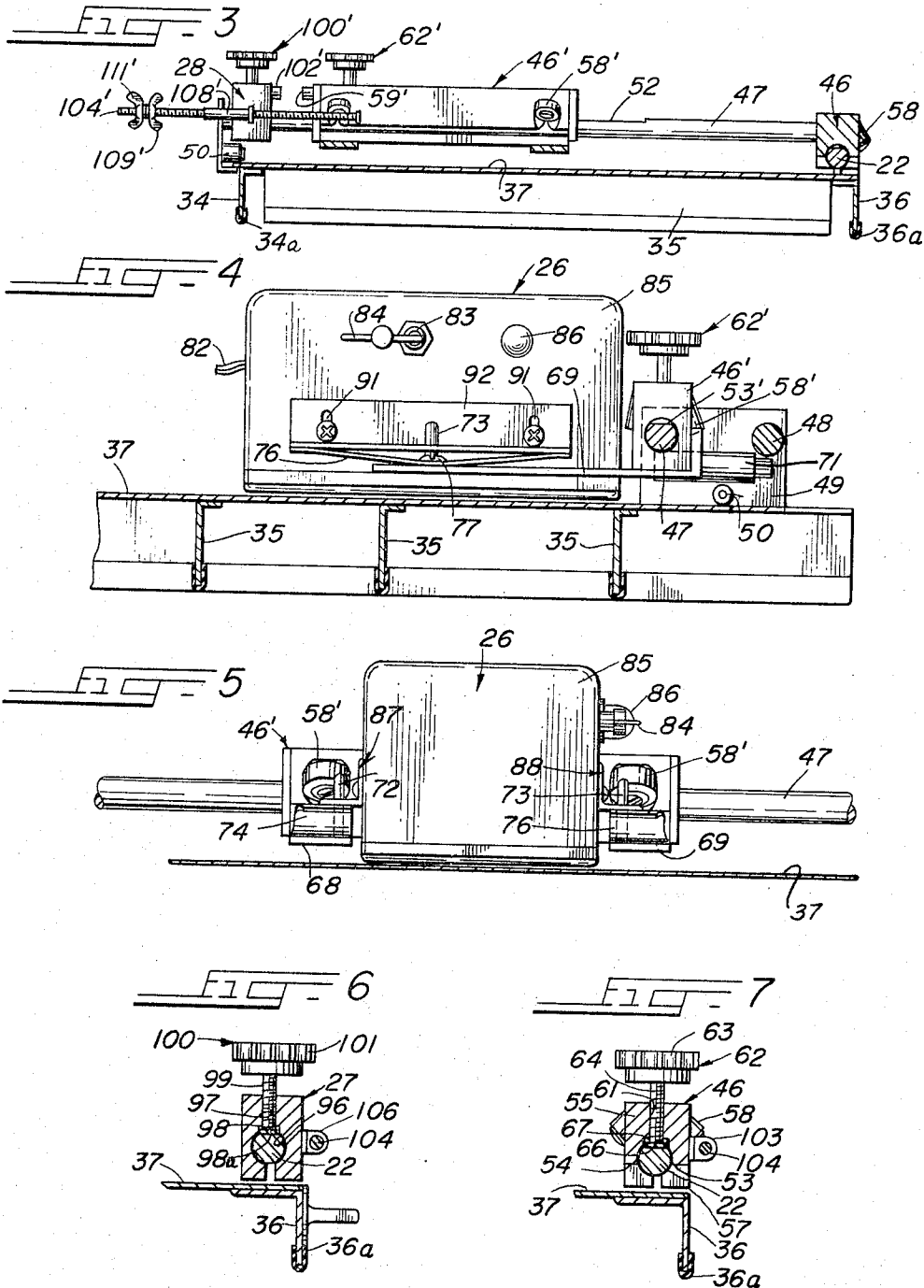
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MULTIPLE CONTACT PRINTING MACHINE

Filed Oct. 7, 1964

4 Sheets-Sheet 2



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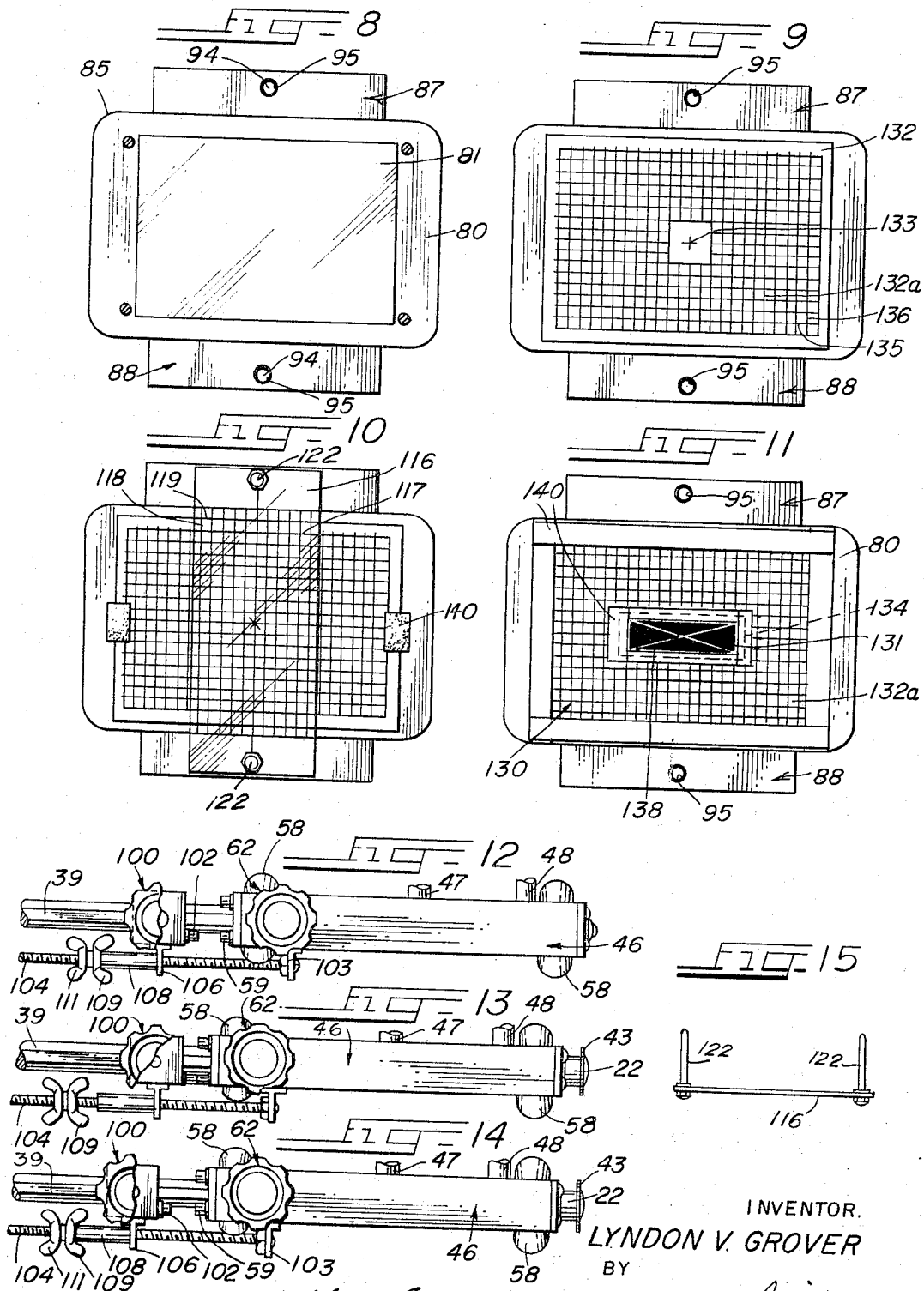
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MULTIPLE CONTACT PRINTING MACHINE

Filed Oct. 7, 1964

4 Sheets-Sheet 3



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3,353,469

MULTIPLE CONTACT PRINTING MACHINE

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4 Sheets-Sheet 4

Fig. 16

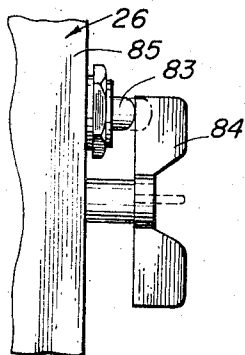


Fig. 17

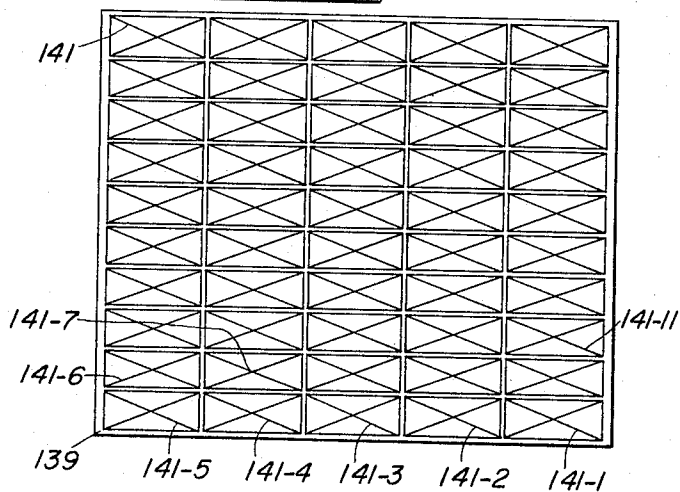
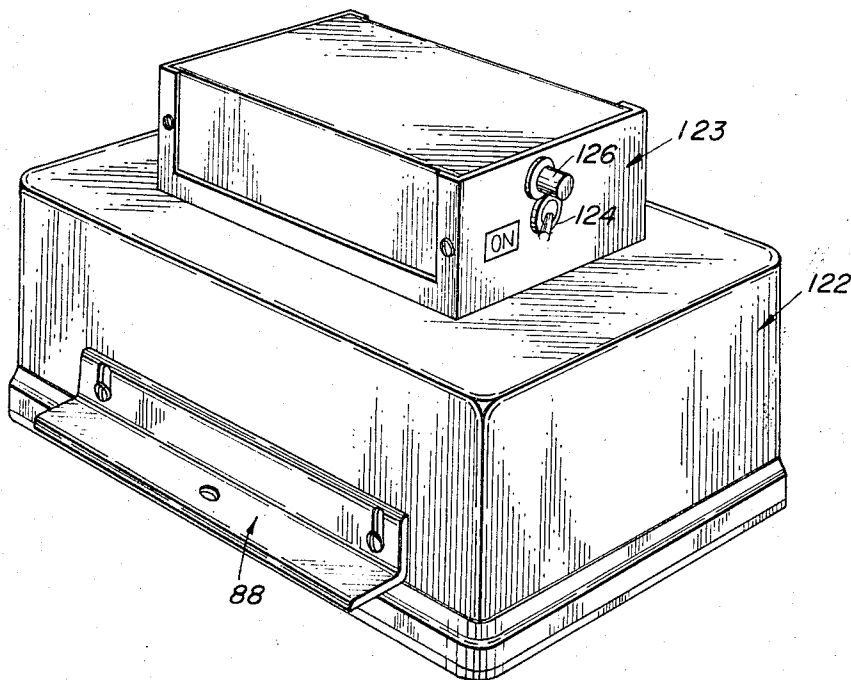


Fig. 18



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3,353,469

MULTIPLE CONTACT PRINTING MACHINE

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38 Claims. (Cl. 95-73)

ABSTRACT OF THE DISCLOSURE

A graphic arts step and repeat machine has a table on which an image holder is rectilinearly supported. Adjustable stops are provided to be sequentially actuated to move the image holder by uniform increments in each axis. The table has indicia by which a sensitized workpiece is aligned with respect to the stops. A method is provided by which an image, such as a transparency, is accurately aligned with respect to the image holder.

This invention generally relates to a graphic arts printer and a method of attaching a transparency to an exposure unit and more particularly relates to a manual step and repeat multiple-contact-printing or easel graphic arts printer and a method of properly aligning a transparency on the transparency support surface of an exposure unit thereof.

The present invention provides a method and apparatus to rapidly and accurately print a plurality of images on a sensitized sheet of material, e.g., photosensitive paper and metal sheets. The multiple printing graphic arts printer of the present invention may be effectively utilized by photo-engravers, offset printers, silk screen processors, name plate and dial makers, and photographers. The printer comprises a table with effective means for aligning a sensitized sheet on the table, for providing repeatable movement of an exposure unit, for attaching a transparency to said exposure unit, for braking and maintaining the exposure unit in one of its repeatable positions during the use thereof, and for accurately providing repeatable movement of the exposure unit.

Therefore, it is an object of the present invention to provide an improved multicontact printer.

It is still another object of the present invention to provide a manual graphic arts printer for multicontact printing having accurate X- and Y-axes step and repeat adjusting means.

It is still another object of the present invention to provide a graphic arts printer for manual multicontact printing having manually adjustable means for accurately presetting each step of the printing, and means to hold an exposure unit of the printer in a predetermined printing position.

It is still another object of the present invention to provide a graphic arts printer for multiple contact printing comprising X- and Y-axes-step-moving-means connected to a table having a surface for supporting a sensitized sheet of material, the Y-axis-step-means being movable along the X-axis-step-means, a light source or exposure unit being connected to the Y-axis step means, means connected to the X-axis and Y-axis step means to provide accurate repeatable step movement thereof, brake means to releasably hold the X- and Y-axes step means in their step positions, and resilient means to normally maintain the light source above the table surface.

It is still a further object of the present invention to provide a method for aligning a transparency on a translucent surface of a light source.

It is still another object of the present invention to provide a method of using a transparent plate having guide and grid means for aligning a transparency on a

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translucent surface of a light source by centrally attaching a transparency onto an opaque sheet, removing a central portion of the opaque sheet so as to provide a mask extending around the periphery of the transparency and using the transparent plate to align the transparency on the translucent surface with respect to a reference.

Another object of the present invention is to provide a method for masking a light source and aligning a transparency on the light source with respect to a reference means and with the aid of an alignment means.

Other objects, features, and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following description and accompanying drawings wherein like reference numerals refer to like and corresponding parts.

On the drawings:

FIG. 1 is a perspective view illustrating a graphic arts printer for multiple contact printing constructed in accordance with the principles of the present invention;

FIG. 2 is a top view of the graphic arts printer of FIG. 1;

FIG. 3 is a transverse cross-sectional view, with parts in elevation, of the graphic arts printer taken along line III—III of FIG. 2;

FIG. 4 is a partial longitudinal cross-sectional view, with parts in elevation, of the graphic arts printer taken along line IV—IV of FIG. 2;

FIGURE 5 is a partial transverse cross-sectional view, with parts in elevation, of the graphic arts printer taken along line V—V of FIGURE 2;

FIGURE 6 is a partial transverse cross-sectional view with parts in elevation of the graphic arts printer taken along line VI—VI of FIGURE 2;

FIGURE 7 is a partial transverse cross-sectional view, with parts in elevation, taken along line VI—VI of FIGURE 2;

FIGURE 8 is a bottom view of an exposure unit of the invention;

FIGURE 9 is a bottom view illustrating one step in a method of image alignment in accordance with the principles of the present invention;

FIGURE 10 is a bottom view showing another step in such method;

FIGURE 11 is still a further bottom view illustrating still a further step in such method;

FIGURE 12 is a partial top elevational view illustrating a step in the method of step and repeat multiple contact printing in accordance with the principles of the present invention;

FIGURE 13 is a partial top elevational view illustrating a further step in the method of step and repeat multiple contact printing;

FIGURE 14 is a top elevational view illustrating still another step in the method of step and repeat multiple contact printing;

FIGURE 15 is a side view with parts in elevation illustrating an alignment grid used in combination with the graphic arts printer of the present invention;

FIGURE 16 is a partial side view illustrating an exposure unit of the graphic arts printer of the present invention;

FIGURE 17 illustrates a sensitized sheet of material having a plurality of images thereon and which was manufactured in accordance with the method of the present invention; and

FIGURE 18 is a perspective view illustrating a further exposure unit.

As shown in the drawings:

Referring to FIGURES 1 to 3, there is illustrated a manual multiple contact printing graphic art printer 20. The graphic arts printer comprises a table 21, a fixed rigid guide rail 22, a rigid carriage assembly 23, an ex-

posure unit support or light source support 24, an exposure unit or light source or image holder 26, a first travel stop block 27, a second travel stop block 28, a first step travel adjusting means 29, a second step travel repeat adjusting means 31, and sensitized sheet-alignment-grid-indicia 32.

The table 21 includes a substantially rectangular anodized aluminum table top 33, a pair of anodized aluminum angle legs 34 and 36 suitably attached to the table top and extending along opposite sides thereof, and a plurality of angle braces 35 extending between the legs 34 and 36 and suitably connected to the table top by countersunk screws 35a. The table top has a surface 37 adapted to support a sensitized sheet (not shown) and the legs 34 and 36 have suitable rubber boots 34a and 36a on their respective ends.

The fixed rigid guide rail 22 is generally cylindrical in cross section and has a relatively flat top surface 39 extending for a major portion of the length thereof. The guide rail is rigidly connected to the table top 33 and supported a predetermined distance above the table surface 37 by a plurality of support bars 41. The fixed guide rail 22 extends parallel to one edge of the table and will hereinafter be referred to as extending along the X-axis. A pair of carriage stop washers 42 and 43 are connected by bolts 44 to the ends of the guide rail 22. The stop washer 43 acts as an end limit means as well as a starting reference for the carriage assembly 23.

The rigid carriage assembly 23 comprises a rectangular travel block 45 movably supported on the fixed guide rail 22, a pair of spaced parallel movable guide rails 47 and 48 secured to the travel block and extending therefrom in a direction perpendicular to the direction of the fixed guide rail 22 and which will hereinafter be set forth as extending along the Y-axis, a perpendicular guide plate 49 attached to the other ends of the movable guide rails 47 and 48, and said guide plate 49 having a lower lip 51 extending beneath the table surface 37 and having a roller 50 rotatably connected thereto and extending inwardly therefrom to movably engage the table surface 37 along an edge opposite to said one edge thereof and to support and guide the carriage assembly 23 therealong.

The movable inner guide rail 47 is generally cylindrical in cross section and has a relatively flat top surface 52 extending from the guide plate for a major portion of its length.

Referring also to FIGURE 7, the carriage travel block 46 is a rectangular block 55 having a pair of rectangular end washers 56 and 57 suitably affixed to the ends thereof and a passage or groove 53 passing axially through the washers and along block bottom surface 54. The fixed guide rail 22 passes through the passage 53 in slightly spaced relation to enable free movement of the block along the fixed guide rail parallel to the X-axis.

Four hard rubber rollers 58 are suitably rotatably connected to the block 55 with their rotational axes extending transversely to the guide rail 22 and at an angle to the table surface. The rollers extend within the travel block 46 and engage the curved surface of the fixed guide rail 22 to support and guide the travel block 46 therealong.

A pair of Allen head screws 59, one of which is also functionally a stop 59, extends axially for a predetermined distance from the travel block end washer 56. The function of the stop 59 is described hereinafter in greater detail.

A carriage lock means 62 as illustrated in FIGURE 7, is connected to the block 55 adjacent one end thereof and comprises a threaded vertical passage 61 extending substantially perpendicularly to the block passage 53, a brake shoe counterbore 67 interconnecting the threaded passage and the block passage, a threaded rod 64 threaded into the passage 61 and having a manual turning knob 63 attached to the outer end thereof, and a relatively flat cylindrical brake shoe 66 within the counterbore 67 and having one end facing the rod 64 and the other end

facing the flat top surface 39 of the fixed guide rail 22. The brake shoe 66 is made of any suitable material such as hardened steel. The brake shoe 66 slidably fits within the counterbore 67 and has a thickness less than the length of the counterbore 67. Thus, when the rod 64 is moved sufficiently towards the guide rail 22, it urges the brake shoe 66 into braking engagement with the rigid guide rail flat surface 39. This braking engagement effectively stationarily locks the carriage onto the rigid guide rail 22.

The base of the washers 56 and 57, the guide plate 49 and roller 50, and the brake shoe 66 and rigid guide rail flat surface 39, all aid in preventing rotational movement of the carriage 23 about the axis of the rigid guide rail 22.

Referring to FIGURES 2 to 5, the light source support 24 comprises a travel block 46' which is identical to the carriage travel block 46 and therefore, the numerals indicating the various portions of the travel block 46' are identical to the numerals indicating the various portions of the travel box 46 except they contain the prime indicia.

The Y-axis travel block 46' comprises four rollers 58', a block lock 62', a pair of rectangular end washers 56' and 57' with the rectangular washer 57' having a pair of Allen head stop members 59' projecting therefrom, and an arcuate passage 53' passing therethrough. The carriage inner guide rail 47 passes through the passage 53' and the travel block 46' is supported thereon by the rollers 58'. The lock 62' is operated in the same manner as the lock 62 and therefore has a brake shoe (not shown) that engages the carriage inner guide rail flat surface 52 to lock the travel block 46' thereon.

A U-frame 65 having a pair of spaced parallel rectangular U-frame legs 68 and 69 is suitably attached to the bottom of the vertical travel block 46'. The U-frame legs extend for a predetermined distance along the X-axis perpendicularly away from the carriage outer rail 48. The U-frame legs are spaced apart and above the table surface 37 such that the light source 26 is supported floatingly therebetween. A rod member 71 is suitably attached to the travel block 46' and extends perpendicularly therefrom towards the outer guide rail 48 and movably engages the bottom surface thereof to prevent or limit rocking movement of the travel block 46' about the axis of the rail 47 and to maintain the legs 68 and 69 a predetermined distance above the table surface 37.

A pair of needle bearing guide pins 72 and 73 extends perpendicularly upwardly from the respective U-frame legs 68 and 69. A pair of leaf spring means 74 and 76 are attached respectively to the U-frame legs 68 and 69 by suitable screw means 77. Each of the leaf springs 68 and 69 has relatively flattened ends 78 and 79 which are adapted to suitably support the light source 26 as will be hereinafter described in greater detail.

Referring to FIGURES 4, 5 and 8, the light source 26 is a rectangular box 85 having a bottom face 80 with a rectangular transparency support surface 81, of suitable translucent glass, spaced inwardly from the edges of the face 80. A suitable light bulb (not shown) is within the light source box 85 and receives its power supply through wires 82 which may be suitably connected to a common electrical outlet. A switch 83 is suitably electrically connected to the light bulb and is normally in its off position. When the switch 83 is depressed, it is in its "on" position. A wing nut means 84 is connected adjacent the switch 83 and may be turned to have the end thereof contact the switch 83 to depress and maintain the switch in a depressed position (FIGURE 16). Adjacent to the other side of the switch 83 is a red jewel indicator light 86 that communicates with the bulb within the box 26 to assure the operator that exposure has been made.

Two elongated angle guides 87 and 88 are vertically adjustably attached on opposite sides of the box 85 adjacent the bottom face thereof by screws 89 which pass through elongated slots 91 formed in the angle guide

walls 92. The angle guide walls 93 have circular reference or guide ports 94 with races 95 therein that are slidably receptive of the perpendicular guide pins 72 and 73. The angle guides 87 and 88 may be suitably adjusted on the walls of the light box 85 such that when the light box 85 is placed on the light source support 24 with the bottom surfaces of the angle guide walls 93 engaging the relatively flat ends of the leaf springs 74 and 76 and the guide pins 72 and 73 passing through the guide races 95, the glass transparency support surface 81 is spaced a predetermined distance above the table surface 37 and extends relatively parallel thereto, as illustrated in FIGURES 4 and 5.

The travel stop blocks 27 and 28 are of identical structure and, therefore, only the travel stop block 27 will be described in detail. Referring to FIGURE 6, the travel stop block 27 has a relatively short length with a cylindrical passage 96 to slidably receive the rigid guide rail 22. The stop block 27 has a lock 100 comprising a threaded vertical passage 97, a brake shoe counterbore 98 interconnecting the passage 97 and the block passage 96, a cylindrical brake shoe 98a floatably mounted in the counterbore 98 and facing the flat surface of the guide rail 22, and a threaded bolt member 99 threaded into the passage 97 and having an enlarged knob 101 attached to the outer end thereof. Thus, by turning the knob 101, the bolt 99 urges the brake shoe 98 against the guide rail flat surface 39 to lock the block 27 onto the guide rail 22. An Allen head stop member 102 projects from one end of the travel stop block towards the carriage travel block 46 and is engageable with one of the travel block stop members 59. The stops 59 and 102 contact each other to limit the relative movement of the carriage travel block and the carriage travel stop block in one direction.

Likewise, as shown in FIGURE 3, the travel stop block 28 has a lock 100' that locks the block 28 onto the carriage guide rail 47 and an Allen head stop member 102' projecting from one end thereof towards the light source support travel block 46' and engageable with the stop member 59'.

The step travel adjusting means 29 and 31 are identical and, therefore, the description hereinafter will be limited to the step travel adjusting means 29. Referring to FIGURES 1, 2, and 12 to 14, the step means 29 comprises a bracket 103 extending outwardly from one side of the travel block 46 and having suitably affixed thereto a rod or bolt 104 that extends therefrom towards the travel stop block 27 parallel to the rigid guide rail 22. The stop block 27 has an apertured bracket 106 which projects from one side thereof. The bracket aperture 107 is axially aligned with the bolt 104 and the bolt freely passes there-through. A tubular spacer 108 slidably passes over the end of the bolt 104 and has one end attached to the stop lock bracket 106 and the other end adapted to engage an adjusting wing nut means 109 which may be locked into a predetermined position by a second wing nut 111. The operation of the travel repeat adjusting means is described hereinafter in greater detail.

The alignment-guide-indicia 32 is located adjacent to one corner of the table surface 37 and has a grid 110 so sized and arranged as to enable compensation for various sizes of transparencies, and defining a center reference 112, an X-axis with a plurality of spaced X-axis lines 114, and a Y-axis with a plurality of spaced Y-axis lines 113.

Referring to FIGURES 10 and 15, a rectangular alignment plate 116 of transparent plastic has imprinted or suitably attached thereto a grid 117 having a plurality of lines 118 extending in the Y-axis and a plurality of lines 119 extending in the X-axis with a central diagonal cross 121. The Y-axis lines 118 and X-axis lines 119 are spaced apart the same distance as the alignment grid Y-axis lines 113 and X-axis lines 114. The alignment plate 116 has a width less than the length of the translucent surface 81 and has extending therefrom two perpendicular guide pins 122 which are spaced apart the same distance as the light source support guide pins 72 and 73 and are adapted to

slidably pass through the light source angle guide races 95.

The alignment-guide-indicia 32 is located such that when the end of the travel block 46 abuts the reference washer 43 and the end of the travel block 46' abuts the travel block 46, the center reference of the translucent surface 81, as determined by the center 121 of the plate grid 117, coincides with the center 112 of the alignment indicia 32. Thus, a workpiece such as a sensitized sheet may be suitably aligned on the table surface 37 by use of the alignment-guide-indicia 32.

In FIG. 18, there is illustrated a light source or image holder 122 which is similar to the light source 26 except that it emits light of much higher intensity, and to this end, it includes a light of the electronic flash type rather than an incandescent light bulb. The electronic flash source 122 has an additional activating means generally indicated at 123 of well known structure which comprises an "off" switch 124 and an actuation depression switch 126. When the switch 124 is placed in the "on" position and the electronic flash light source 122 is connected to a suitable source of electric power, the electronic flash light is caused to flash by depressing the switch 126. The light source 122 is "precharged" after a predetermined nominal amount of time has passed, such time being somewhat less than that needed to index or reset the light source support 24 in a single axis.

As shown in FIG. 11, a transparency and opaque sheet or mask assembly 130 has been attached to the translucent surface 81 of the light source enclosure 85 with the transparency or negative 131 suitably aligned with respect to the reference means 95 and thus also with respect to the alignment grid 110 of the table 21. The mask assembly 130 includes a paper sheet 132 (FIG. 9) of a color which is opaque to the photo-sensitive workpiece, the sheet 132 having a grid 132a with a central right angle cross marking 133 and X-axis and Y-axis grid lines 135 and 136 respectively corresponding to the right angle cross 112 and the X-axis and Y-axis lines of the alignment grid 110 and corresponding to the plate grid 117.

The method of alignment and attachment of the assembly 130 comprises a feature of my invention. This method comprises a number of steps which may best be understood by reference to FIGS. 8-11. The light source enclosure 85 is inverted as shown in FIG. 8 so that the translucent surface 81 extends toward the viewer. This method envisions the providing of an opaque sheet 132, shown in FIG. 9, having a size which substantially covers the translucent surface 81, such sheet 132 having a grid 132a thereon corresponding dimensionally in spacing to the spacing in the easel grid 110. The opaque sheet's grid 132a includes lines or indicia 135 extending parallel to the X-axis, and a number of lines 136 extending parallel to the Y-axis. Centrally of the grid 132a, there is provided a central or center reference 133 in the nature of a cross.

Either before or after the step of placing the opaque sheet 132 on the translucent surface 81 is performed, the transparent alignment plate 116 is assembled with the light source enclosure 85 as shown in FIG. 10. To this end, the guide means 122 of the alignment plate 116 are manually inserted into the openings of the guide means 95 of the enclosure 85, thereby aligning the plate grid 117 with the guide means 95. Upon sufficient insertion of the alignment plate guide means 122, the opaque sheet 132 at its opposite surfaces engages the translucent surface 81 and the adjacent surface of the alignment plate 116.

With the opaque sheet 132 and the alignment plate 116 arranged as shown in FIG. 10, the transparency 137 is inserted between the opaque sheet 132 and the alignment plate 116 with its emulsion or other image producing means 138 directed toward the viewer. The transparency 137 is then manually moved about in both the X- and Y-axes so that the center of the image registers with the reference cross 121 shown in FIG. 10. (It may be assumed that the transparency image will mask the central

cross 133 of the opaque sheet 132.) With the transparency 131 thus aligned, and with the central reference mark 133 also previously centered with respect to the central reference 121, the transparency 131 is manually attached at its periphery to the opaque sheet 132. This is preferably done by means of masking tape 140 which is of a type that is opaque to such frequencies of the light source 26 as will expose the photosensitive sheet. The opaque sheet 132 and the transparency 137, together with the above-mentioned quantity of tape 140 thus joined to comprise an opaque sheet and centered transparency assembly 130.

The sheet and transparency assembly 130 are now removed as a unit from the enclosure 85 and alignment plate 116. The assembly 130 is inverted to enable the further step of removing a central portion 134 of the opaque sheet 132 (including the reference indicia 133). To this end, it is preferred that straight cuts be made parallel to the X- and Y-axes so as to define a rectangular opening, the edges of which surround the outer periphery of the transparency 131 in laterally outwardly spaced relation. This opening is only in the opaque sheet 132 so that the tape 140 which overlaps the peripheral edges or margins of the transparency 131 determines the exact dimensional limits of the zone to be exposed. Since the tape 140 thus serves to mask the limits of the central opening provided in the sheet 132, and since the sheet 132 projects laterally therefrom toward the outer limits of the illuminated translucent surface 81, the actual masking is thus provided by the joint action of the tape 140 and the remaining portion of the opaque sheet 132.

Upon completion of the removing of the central portion 134 of the opaque sheet 132, the assembly 130 is thereafter reinserted manually between the translucent surface 81 and the alignment plate 116 as described before. Thereafter, the assembly 130 is moved about laterally in both the X- and Y-axes to a position in which the remaining portion of the sheet grid 132a is again aligned with the grid 117 of the alignment plate 116. This aligning step must be done carefully, because by this step, the position of the image 138 of the transparency 131 is given its final alignment or location with respect to the guided light source enclosure 85.

Once the remaining portion of the grid 132a has been realigned with the alignment plate grid 117, further tape 140 is manually applied along the entire outer periphery of the opaque sheet 132 to lock or fix the position of the assembly 130 in fixed relation to the enclosure 85, to maintain thereby its alignment, and to seal optically the entire outer periphery of the assembly 130 to the light source enclosure 85. Upon completion of this step, the alignment plate 116 is removed manually from the enclosure 85, thereby completing the alignment method to render the enumerated components arranged in the manner illustrated in FIG. 11.

A variation of the foregoing method includes the step of removing the central portion 134 of the opaque sheet 132 before the sheet 132 is first inserted, such variation in the method enabling the omission of the steps of removing and reinserting the assembly 130.

A further variation of the above method includes the step of initially accurately locating and taping the opaque sheet 132 with its grid 132a in alignment with the alignment plate grid 117. The transparency is then, if necessary, cut to a size slightly larger than the area to be exposed and is placed centrally on the opaque sheet 132, as indicated by its relative position with respect to the reference cross 121. Such positioning delineates a central portion 134 of the opaque sheet 132 which is to be removed, such central portion being that which is overlaid by the transparency 131. If desired, the size of such central opening 134 may slightly exceed the overall size of the transparency. The tape 140 is then applied as a holding means and as a mask in overlying relation to the inner margin of the apertured opaque sheet, and in overlying relation to the outer margin of the transparency 131 in such position

as to define the portion of the transparency which is to be exposed to light.

Once the opaque sheet and transparency assembly 130 has been attached and aligned on the enclosure 85 in accordance with the steps of the foregoing method, the printer-easel 20 may be used to expose a photosensitive sheet 139 (FIG. 17) a number of times to provide thereon a plurality of reversed images 141 by means of the following operation. Initially, it is necessary to transfer the dimensional length and width of the exposed portion of the transparency 131 to the stepping travel adjusting means 29, 31, and to position the unexposed photosensitive sheet 139 in the proper position on the table surface 37.

In positioning the unexposed sensitized sheet 139, it is desirable not to waste material around its periphery. Assuming that the carriage is positioned to the right as shown in FIGS. 1 and 2, and assuming that the light source support 24 is disposed in abutting relation to the travel block 46 of the carriage 23, it is evident that the light source 26 will overlie the indicia 110. As the reference means 112 of the indicia 110, under this condition, is in direct two-axis alignment with the reference means 133 of the opaque sheet 132, and the cross-type of reference 121 of the alignment type 116, the center of the image 138 is in registration with such reference means 112 on the surface 37. However, it is difficult or impossible to determine the correct position of the corner of the unexposed sheet 139 unless suitable provision, such as that shown herein, is utilized. Thus, to position the sheet 139 on the surface 37 of the easel top 33, and with reference to FIG. 11, the user notes the distance between the center of the transparency 131 and the adjacent edges of the central tape 140. This distance is represented by a certain number of squares or lines in the grid 132a. The sensitized sheet 139 is then placed in overlying relation to a portion of the table grid 110 so that the right edge of the sheet is located to the right of the reference means 112 by a distance corresponding to half of the X-axis dimension of the exposed portion of the transparency. Similarly, the lower or forward edge of the sensitized sheet 139 is disposed a distance toward the fixed guide rail 22 corresponding to half of the Y-axis dimension of the exposed portion of the transparency 131. With the sensitized sheet thus accurately positioned, it is fixed in location as by means of suitable pressure-sensitive tape (not shown). The apparatus 20 is now in position to expose the photosensitive sheet 139 to provide that image indicated by the reference numeral 141-1. It is then desired to shift the light source 26 incrementally in a step-by-step manner so as to produce the images 141-2, -3, -4, -5, -6, -7, etc. To accomplish such predetermined shifting or stepping in an accurate manner, the other transfer of dimensions mentioned above is accomplished.

To this end, the X-axis dimension of the exposed portion of the transparency 131 is measured and transferred to the structure shown in FIG. 12, and in particular to the travel stepping adjusting means 29. One facile manner of making this dimensional transfer is to employ conventional inside calipers (not shown). The lock 62 is first tightened to secure the travel block 46 on the rigid rail 22 in engagement with the reference washer or means 43. With the lock nut means 109 retracted to the left, the stop block 27 is moved to a position where the space between the stops 102 and 59 corresponds to the X-axis dimension of the desired exposed portion, a dimension which is clearly readily mechanically transferred by such calipers. With the stop block 27 thus accurately positioned, the lock 100 is also tightened, and the lock nut means 109 is moved to the right and locked in position in engagement with the tubular portion 108 of the stop block 27. Once this has been accomplished, the lock 62 may be manually released to enable the carriage having the travel block 46 to move to the left to a position limited by and defined by interengagement between the stops 102 and

59. This movement to the left of the carriage shifts the lock nut means 109 to the left a corresponding amount, and the exposure 141-2 may now be made. This exposure is preferably made with the lock 62 in a tightened position to insure against any reverse movement. Thereafter, the stop block 27 is moved to the left until the portion 108 thereof again engages the lock nut means 109, at which position the lock 100 is again tightened, whereupon the travel block 46 may again be shifted to the left as shown in FIG. 13. (The gap defined by the stops 59 and 102 has not been scaled the same as the X-axis dimension in FIG. 11 to minimize the size of illustration.) Thereafter, the stop lock 27 may again be moved to the left as shown in FIG. 14, a procedure which is repeated until the leftmost image 141-5 has been provided.

By using a substantially identical technique, the travel stepping adjustment means 31, which during the foregoing stepping and exposing has been locked in position against the travel block 46, is indexed away from the travel block 46 by one step, to place thereby the transparency in position to expose the image 141-6. With the Y-axis stepping adjusting mechanism 31 remaining in a locked position, the structure of FIG. 12 is operated in reverse from that described above to place the light source 26 successively and accurately, in reverse order, in the positions previously occupied along the X-axis structure. When the light source 26 reaches its original X-axis position, the Y-axis stepping adjustment means 31 is again indexed by one space.

Attention is invited to the fact that since the travel block 46 periodically returns to engage the stop means 43, there is no tendency for tolerances to build-up so as to affect the dimensional accuracy in the X-axis of the image 141-11. The foregoing procedure of operation, if desired, may be shown in a rudimentary form as shown on FIG. 2 at 136.

From the structure described above, it is evident that there is a clearance between the upper surface of the photosensitive sheet 139, and the lowest surface of any of the elements described above carried on the lower side of the light source 26. Thus the transparency may be moved about without becoming scratched, and the light source may be moved about without any possible damage to the finish of the sheet 139. However, as the present invention contemplates contact printing for each exposure, a slight manual pressure applied to the upper side of the light source 26 in a downward direction causes the same to move against the force of the leaf springs 74, 76 to a position of engagement with the photosensitive sheet 139. No shift occurs during such vertical movement in the direction of either the X-axis or the Y-axis because of the guiding function of the guide pins 72, 73.

The light source 26 has an intensity such that a few seconds of illumination gives adequate exposure. However, when metal plates are used which have a somewhat slower emulsion speed, by substitution of the light source 122 for the light source 26, the exposure time is rendered substantially equivalent.

Typical operation of the disclosed printer is such that an operator may routinely make fifty identical exposures as shown in FIG. 17 on a sheet of photosensitive material in approximately 15 minutes, with each image located with a predetermined accuracy of about 0.002 inch per step. Moreover, the size of each step in each axis is infinitely adjustable within the limits imposed by the size of the machine. Thus photosensitive sheets may be rapidly subjected to repetitive exposure from a single transparency. Attention is invited to the fact that the only settings required are the X-axis dimension and the Y-axis dimension corresponding to each exposed zone, and that the method and apparatus employs no masking film or the masking material on the photosensitive sheet.

The high accuracy of location enables a stack of multiple image sheets to be simultaneously sheared, with the margin remaining constant for all of the individual pieces

thus produced. In that photosensitive metal plate may be directly exposed without the necessity for providing a multiple image negative, a great saving in time and cost is produced where, for example, nameplates are made by this process. A typical exposure time for each image is on the order of one second.

All the various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A graphic arts easel for the multiple positioning of an image with respect to a workpiece, comprising in combination:

- (a) a table having a surface for supporting the workpiece;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a carriage travel stop means movably supported on said rigid guide rail engageable with abutment surfaces on said rigid carriage to limit movement of said carriage along said rigid guide rail, and providing with said carriage and adjustable repeatable travel distance between said carriage and said carriage stop means;
- (e) a support movably supported on said carriage for movement in a second direction parallel to said table surface and transverse to said first direction; and
- (f) an image holder supported by said support and having an image support surface directed toward said table surface.

2. A graphic arts easel for the multiple positioning of an image with respect to a workpiece, comprising in combination:

- (a) a table having a surface for supporting the workpiece;
- (b) a single rigid guide rail fixedly secured to said table and disposed along only one edge thereof;
- (c) a rigid elongated carriage movably supported at one end on said rigid guide rail and at the opposite end on said table surface;
- (d) a support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction; and
- (e) an image holder having an image support surface directed toward said table surface and said image holder being supported by said support.

3. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a surface for supporting the sensitized sheet;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said rigid guide rail for movement in a first direction parallel to said table surface, said carriage comprising a pair of movable rails disposed in spaced relation to each other;
- (d) a light source support carried by a first of said movable rails and freely rockable about the axis thereof, said support including a first portion extending away from both of said movable rails for engaging the light source, and a second portion extending away from said first of said movable rails and into engagement with the second of said movable rails and limiting the extent of the rocking of said support in only one angular direction, said support being movable on said movable rails in a second direction parallel to said table surface and transverse to said first direction; and
- (e) a light source having a transparency support sur-

face directed toward said table surface and supportable by said support.

4. A graphic arts easel for the multiple positioning of an image with respect to a workpiece, comprising in combination:

- (a) a table having a surface for supporting the workpiece;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a first stop means movably supported on said rigid guide rail and engageable with rigid abutment surfaces on said rigid carriage to limit movement of said carriage along said guide rail, and providing with said carriage an adjustable repeatable travel distance between said carriage and said first stop means;
- (e) a support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction;
- (f) a second stop means movably supported on said rigid carriage and engageable with rigid abutment surfaces on said support to limit movement of said support along said rigid carriage and providing with said support an adjustable repeatable travel distance between said support and said second stop means; and
- (g) an image holder having an image support surface directed toward said table surface and said image holder being supported by said support.

5. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a surface for supporting the sensitized sheet;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a light source support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction, said support including a U-frame having a pair of spaced legs with free ends projecting as cantilevers and extending in said first direction away from said carriage and spaced a predetermined distance above the table surface, and guide means mounted on the U-frame legs;
- (e) a light source supported on said support U-frame legs and guided by said support guide means for movement toward the sensitized sheet and said light source including a transparency support surface extending between said U-frame legs and directed toward said table surface.

6. A graphic arts easel for the multiple positioning of an image with respect to a workpiece, comprising in combination:

- (a) a table having a surface for supporting the workpiece;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said fixed guide rail for movement in a first direction parallel to said table surface;
- (d) a first stop means movably supported on said rigid guide rail and engageable with rigid abutment surfaces on said rigid carriage to limit movement of said carriage along said guide rail, and providing with said carriage an adjustable repeatable travel distance between said carriage and said first stop means;
- (e) a support movably supported on said carriage for movement in a second direction parallel to said table surface and transverse to said first direction, said support including a guide means and a spring means; and

(f) an image holder having an image support surface directed toward said table surface and said image holder being supported by said spring means for normally holding said image support surface away from said table surface and guidingly connected to said guide means for movement toward said table surface.

7. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a surface for supporting the sensitized sheet;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage assembly movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a fixed stop member carried by said table and engageable by said carriage to define a first origin point.
- (e) a light source support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction, said support being engageable with an abutment on said carriage at one end of its travel to define a second origin point;
- (f) a light source having a transparency support surface directed toward said table surface, said light source being supported by said support; and
- (g) indicia means on said table surface for locating the sensitized sheet on said surface, and said indicia means being so located with respect to said origin points as to align one corner area of the sheet beneath said light source.

8. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a surface for supporting the sensitized sheet;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a carriage travel stop means movably supported on said rigid guide rail to limit movement of said carriage along said rigid guide rail;
- (e) a carriage travel adjusting means interconnecting said carriage with said carriage stop means to provide a repeatable travel distance between said carriage and carriage stop means;
- (f) a light-source support movably supported on said carriage for movement in a second direction parallel to said table surface and transverse to said first direction; and
- (g) a light source supportable by said support and having a transparency support surface directed toward said table surface.

9. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a surface for supporting the sensitized sheet;
- (b) a rigid guide rail fixedly secured to said table;
- (c) a rigid carriage assembly movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
- (d) a first stop means movably supported on said rigid guide rail to limit movement of the carriage along the guide rail;
- (e) a first step travel adjusting means interconnecting said carriage assembly with said first stop means to provide a repeatable travel distance between said carriage assembly and said first stop means;
- (f) a light source support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction;

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- (g) a second stop means movably supported on said rigid carriage to limit movement of said light source support along said rigid carriage;
 - (h) a second step travel adjusting means interconnecting said second stop means and said light source support to provide a repeatable travel distance between said light source support and said second stop means; and
 - (i) a light source having a transparency support surface directed toward said table surface and supportable by said support.
10. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a surface for supporting the sensitized sheet;
 - (b) a rigid guide rail fixedly secured to said table;
 - (c) a rigid carriage assembly movably supported on said rigid guide rail for movement in a first direction parallel to said table surface;
 - (d) a fixed stop member carried by said table and engageable by said carriage to define a first origin point;
 - (e) a first stop means movably supported on said rigid guide rail to limit movement of the carriage along the guide rail;
 - (f) a first step travel adjusting means interconnecting said carriage assembly with said first stop means to provide a repeatable travel distance between said carriage assembly and said first stop means;
 - (g) a light source support movably supported on said rigid carriage for movement in a second direction parallel to said table surface and transverse to said first direction;
 - (h) a second stop means movably supported on said rigid carriage to limit movement of said light source support along said rigid carriage;
 - (i) a second step travel adjusting means interconnecting said second stop means and said light source support to provide a repeatable travel distance between said light source support and said second stop means;
 - (j) a light source having a transparency support surface directed toward said table surface and supportable by said support; and
 - (k) indicia means on said table surface for locating sensitized sheet on said surface, and said indicia means being so located with respect to said origin points as to align one corner area of the sheet beneath said light source.
11. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a surface for supporting the sensitized sheet;
 - (b) a rigid guide rail fixedly secured to said table;
 - (c) a rigid carriage assembly movably supported on said fixed guide rail for movement in a first direction parallel to said table surface, said carriage assembly comprising a pair of movable rails disposed in spaced relation to each other;
 - (d) a first stop means movably supported on said fixed guide rail to limit movement of said carriage along said fixed guide rail;
 - (e) a first step travel adjusting means interconnecting said carriage assembly with said first stop means to provide a repeatable travel distance between said carriage assembly and first stop means;
 - (f) a light source support carried by a first of said movable rails and rockable about the axis thereof, said support including a portion extending therefrom into engagement with the second of said movable rails and limiting the rocking of said support in one angular direction, said support being movable on said movable rails in a second direction parallel to said table surface and transverse to said first direction;
 - (g) a second stop means movably supported on said

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- first movable rail to limit movement of said support on said first movable rail;
 - (h) a second step travel adjusting means interconnecting said support and said second stop means to provide a repeatable travel distance between said support and second stop means; and
 - (i) a light source having a transparency support surface directed toward said table surface and supportable by said support.
12. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a surface for supporting the sensitized sheet;
 - (b) a rigid guide rail fixedly secured to said table;
 - (c) a rigid carriage assembly movably supported on said fixed guide rail for movement in a first direction parallel to said table surface;
 - (d) a first travel stop means movably supported on said fixed guide rail to limit movement of said carriage along said fixed guide rail;
 - (e) a first step travel adjusting means interconnecting said carriage assembly with said first stop means to provide a repeatable travel distance between said carriage assembly and first stop means;
 - (f) a light source support movably supported on said carriage assembly for movement in a second direction parallel to said table surface and transverse to said first direction, said support including a guide means and a spring means; and
 - (g) a light source having a transparency support surface directed toward said table surface and supported by said spring means for normally holding said transparency surface away from said table surface and guidingly connected to said guide means for movement toward said table surface.
13. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet, said top surface having alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis;
 - (c) a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (d) a rigid carriage assembly comprising a travel means movably supported on said fixed guide rail for movement thereby along said fixed guide rail parallel to the X-axis, and first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail;
 - (e) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail;
 - (f) second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (g) a light source support movably mounted on said carriage and movable therewith parallel to the X-axis;
 - (h) a light source comprising a box enclosing an electrical exposure light means, and a switch electrically connected to said light means, said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; and
 - (i) a first step travel adjusting means connected to said

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carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly.

14. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly movably supported on said fixed guide rail for movement parallel to the X-axis; said carriage having first and second spaced parallel guide rails movable parallel to the X-axis and extending parallel to the Y-axis;
- (d) a first travel stop means slidably connected to said fixed guide rail; and first lock means attached to said first stop means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means slidably connected to said first movable rail, and second lock means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; and third lock means attached to said support to lock said support in a preselected position on said first movable rail;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
- (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said support.

15. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage

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assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;

- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support to limit rocking movement of said support about the axis of said first movable rail;
 - (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
 - (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
 - (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.
16. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support movably mounted on said first movable rail and movable there along parallel to the Y-axis; fourth lock means connected to said light source support and including manual actuator means to lock said light source support in a preselected position on said first movable rail; means attached to said light source support to limit rocking

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movement of said light source support about the axis of the first movable rail; said light source support having a U-frame with a pair of parallel legs being spaced a predetermined distance apart and above the table surface; and a pair of guide pin and spring means respectively extending from each U-frame leg;

(g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; and said box supported and guided by said guide pin and spring means for movement toward said table surface;

(h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and

(i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

17. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

(a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;

(b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;

(c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;

(d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;

(e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;

(f) a light source support movably mounted on said first movable rail so as to move therealong parallel to the Y-axis; fourth lock means connected to said light source support and including manual actuator means to lock said light source support in a preselected position on said first movable rail; means extending from one side of said light source support towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said light source support about the axis of said first movable rail; said light source support having a U-frame with a pair of parallel legs being spaced a predetermined distance apart and above said table surface; a pair of guide pins

extending respectively from said U-frame legs; and a pair of springs respectively attached to said U-frame legs;

(g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box in optical communication with said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs;

(h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and

(i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

18. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

(a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate the various sizes of transparencies and defining X and Y axes;

(b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;

(c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;

(d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;

(e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;

(f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support to limit rocking movement of said support about the axis of said first movable rail;

(g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;

(h) a separate transparent alignment device for locating the transparency on said transparency support

surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of guide means having a size and spacing by which the transparency may be located with reference to a corner of the sensitized sheet;

- (i) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (j) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

19. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail so as to move therealong parallel to the Y-axis; fourth lock means connected to said light source support and including manual actuator means to lock said light source support in a preselected position on said first movable rail; means extending from one side of said light source support towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said light source support about the axis of said first movable rail; said light source support having a U-frame with a pair of parallel legs being spaced a predetermined distance apart and above said table surface; a pair of guide pins extending respectively from said U-frame legs; and a pair of springs respectively attached to said U-frame legs;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box in optical communication with said light means; said box having a lower translucent transparency support surface corresponding in size

to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs;

- (h) a separate transparent alignment device for locating the transparency on said transparency support surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of pins secured to and extending from said plate, said pins having a size and spacing corresponding to that of said guide pins on said U-frame by which the transparency may be located with reference to a corner of the sensitized sheet;
- (i) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (j) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

20. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support

to limit rocking movement of said support about the axis of said first movable rail;

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
- (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

21. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail so as to move therealong parallel to the Y-axis; fourth lock means connected to said light source support and including manual actuator means to lock said light source support in a preselected position on said first movable rail; means extending from one side of said light source support towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said light source support about the axis of said first movable rail; said light source support having a U-frame with a pair of parallel legs being spaced a predetermined distance apart and above said table surface; a pair of guide pins extending respectively from said U-frame legs; and

a pair of springs respectively attached to said U-frame legs;

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box in optical communication with said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs;
- (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

22. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support comprising: a second travel block movably mounted on said first movable rail to move therealong parallel to the Y-axis; second rollers rotatably connected to said second travel block and extending within said second travel block and contacting said first movable rail and supporting and guiding said second travel block therealong; fourth lock means connected to said second travel block to lock said second travel block in a preselected position on said first movable rail; and

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means attached to said second travel block to limit rocking movement of said second travel block about the axis of said first movable rail;

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
 - (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
 - (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.
23. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support comprising: a second travel block movably mounted on said first movable rail to move therealong parallel to the Y-axis; second rollers rotatably connected to the second travel block and extending within said second travel block and contacting said first movable rail and supporting and guiding said second travel block therealong; fourth lock means connected to said second travel block to lock said second travel block in a preselected position on said first movable rail; a guide rod extending from one side of said second travel block towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said second travel block about the axis of said first movable rail; a U-frame attached to said second travel block and having a pair of parallel legs

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extending from a side opposite to said one side of said second travel block and being spaced a predetermined distance apart and above said table surface; a pair of guide pins respectively extending perpendicularly from said U-frame legs; and a pair of spring means respectively attached to said U-frame leg;

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; and said box supported and guided by said guide pin and spring means for movement toward said table surface;
- (h) a first step travel adjusting means connected to said carriage assembly and said first stop means to provide a step and repeat distance between said first stop means and said carriage assembly; and
- (i) a second step travel adjusting means connected to said support and said second stop means to provide a step and repeat distance between said second stop means and said light source support.

24. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support to limit rocking movement of said support about the axis of said first movable rail;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
- (h) a first step travel adjusting means comprising: a first rod connected to said travel means and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the apertures of which said first rod extends;

- and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (i) a second step travel adjusting means comprising: 5
a second rod connected to said light source support and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
25. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel means movably supported on said fixed guide rail for movement of said travel means along said fixed guide rail, first lock means connected to said travel means and including actuator means to lock said travel means in a preselected position on said fixed guide rail; first and second spaced parallel movable guide rails rigidly extending from said travel means and being movable therewith, and said first and second movable guide rails extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said light source support and including manual actuator means to lock said light source support in a preselected position on said first movable rail; means attached to said light source support to limit rocking movement of said light source support about the axis of the first movable rail; said light source support having a U-frame with a pair of parallel legs being spaced a predetermined distance apart and above the table surface; and a pair of guide pin and spring means respectively extending from each U-frame leg;
 - (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; and said box supported and guided by said guide pin and spring means for movement toward said table surface;
 - (h) a first step travel adjusting means comprising: a first rod connected to said travel means and extend-

- ing parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the apertures of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (i) a second step travel adjusting means comprising: 10
a second rod connected to said light source support and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
26. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support to limit rocking movement of said support about the axis of said first movable rail;
 - (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
 - (h) a first step travel adjusting means comprising:

a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and

- (i) a second step travel adjusting means comprising: a second rod connected to said light source support and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
27. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
 - (f) a light source support comprising: a second travel block movably mounted on said first movable rail to move therealong parallel to the Y-axis; second rollers rotatably connected to the second travel block and extending within said second travel block and contacting said first movable rail and supporting and guiding said second travel block therealong; fourth lock means connected to said second travel block to lock said second travel block in a preselected position on said first movable rail; a guide rod extending from one side of said second travel block towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said second travel block about the axis of

said first movable rail; a U-frame attached to said second travel block and having a pair of parallel legs extending from a side opposite to said one side of said second travel block and being spaced a predetermined distance apart and above said table surface; a pair of guide pins respectively extending perpendicularly from said U-frame legs; and a pair of spring means respectively attached to said U-frame leg;

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; and said box supported and guided by said guide pin and spring means for movement toward said table surface;
 - (h) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
 - (i) a second step travel adjusting means comprising: a second rod connected to said second travel block and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
28. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
 - (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
 - (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
 - (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
 - (e) a second travel stop means movably connected to

- said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support movably mounted on said first movable rail and movable therealong parallel to the Y-axis; fourth lock means connected to said support and including manual actuator means to lock said support in a preselected position on said first movable rail; and means attached to said support to limit rocking movement of said support about the axis of said first movable rail;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
- (h) a separate transparent alignment device for locating the transparency on said transparency support surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of guide means having a size and spacing by which the transparency may be located with reference to a corner of the sensitized sheet; and
- (i) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail, a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released.
29. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;
- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to

- said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support comprising: a second travel block movably mounted on said first movable rail to move therealong parallel to the Y-axis; second rollers rotatably connected to said second travel block and extending within said second travel block and contacting said first movable rail and supporting and guiding said second travel block therealong; fourth lock means connected to said second travel block to lock said second travel block in a preselected position on said first movable rail; and means attached to said second travel block to limit rocking movement of said second travel block about the axis of said first movable rail;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia;
- (h) a separate transparent alignment device for locating the transparency on said transparency support surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of guide means having a size and spacing by which the transparency may be located with reference to a corner of the sensitized sheet;
- (i) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (j) a second step travel adjusting means comprising: a second rod connected to said second travel block and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
30. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis; a fixed stop means attached to said fixed guide rail to act as a first reference;
- (c) a rigid carriage assembly comprising: a travel block movably supported on said fixed guide rail to enable free movement of said travel block along said fixed guide rail parallel to the X-axis; rollers rotatably connected to the travel block and extending within said travel block and contacting said fixed guide rail and supporting and guiding said travel block therealong; first lock means connected to said travel block and including manual actuator means to stationarily lock said travel block in a preselected

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position on said fixed guide rail; a guide plate movably engaging the table adjacent to an edge opposite to said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, and said first movable guide rail extending parallel to the Y-axis;

- (d) a first travel stop means connected to said fixed guide rail for limiting movement of said carriage assembly on said fixed guide rail; second lock means connected to said first stop means and including actuator means to stationarily lock said first stop means in a preselected position on said fixed guide rail;
- (e) a second travel stop means movably connected to said first movable rail; third lock means connected to said second stop means and including manual actuator means to stationarily lock said second stop means in a preselected position on said first movable rail;
- (f) a light source support comprising: a second travel block movably mounted on said first movable rail to move therealong parallel to the Y-axis; second rollers rotatably connected to the second travel block and extending within said second travel block and contacting said first movable rail and supporting and guiding said second travel block therealong; fourth lock means connected to said second travel block to lock said second travel block in a preselected position on said first movable rail; a guide rod extending from one side of said second travel block towards said second movable rail and so movably engaging the lower surface thereof as to limit rocking movement of said second travel block about the axis of said first movable rail; a U-frame attached to said second travel block and having a pair of parallel legs extending from a side opposite to said one side of said second travel block and being spaced a predetermined distance apart and above said table surface; a pair of guide pins respectively extending perpendicularly from said U-frame legs; and a pair of spring means respectively attached to said U-frame leg;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box in optical communication with said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs;
- (h) a separate transparent alignment device for locating the transparency on said transparency support surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of pins secured to and extending from said plate, said pins having a size and spacing corresponding to that of said guide pins on said U-frame by which the transparency may be located with reference to a corner of the sensitized sheet;
- (i) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (j) a second step travel adjusting means comprising: a second rod connected to said second travel block

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and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.

31. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:

- (a) a table having a top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining X and Y axes;
- (b) a rigid guide rail fixedly secured to said table adjacent to one edge thereof and extending parallel to the X-axis, said fixed guide rail having a relatively flat top surface extending for a major portion of the length thereof, said fixed guide rail extending substantially the length of said table; a fixed stop washer attached to said fixed guide rail to act as a reference;
- (c) a rigid carriage assembly comprising: a first travel block movably connected to said fixed guide rail to enable free movement of said first travel block along said fixed guide rail parallel to the X-axis; offset rollers rotatably connected to said first travel block and extending within said first travel block and contacting a curved surface of said fixed guide rail and supporting and guiding said first travel block therealong; first lock means connected to said first travel block and including a first brake shoe member positioned within said first travel block facing said flat surface of said fixed guide rail, and including manual actuator means so operative on said first brake shoe member as to stationarily lock said first travel block in a preselected position on said fixed rigid guide rail, a guide plate movably connected to said table adjacent an edge opposite said one edge thereof; first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith; said first movable guide rail extending parallel to the Y-axis and having a relatively flat top surface extending for a major portion of the length thereof;
- (d) a first travel stop block movably connected to said fixed guide rail for movement of said first stop block along said fixed guide rail parallel to the X-axis; second lock means connected to said first stop block and including a second brake shoe member positioned within said first stop block facing said flat surface of said fixed guide rail, and including manual actuator means so operative on said second brake shoe as to stationarily lock said first stop block in a preselected position on said fixed guide rail;
- (e) a second travel stop block movably connected to said first movable guide rail for movement of said second stop block along said first movable guide rail parallel to the Y-axis; second lock means connected to said second stop block and including a third brake shoe member positioned within said second stop block facing said first movable guide rail flat surface and including manual actuator so operative on said third brake shoe as to stationarily lock said second stop block in a preselected position on said first movable guide rail;
- (f) a light source support comprising a second travel block movably connected to said first movable guide rail for movement of said second travel block along said first movable rail parallel to the Y-axis; second offset rollers rotatably connected to said second travel block and extending within said second travel

- block and contacting a curved surface of said first movable guide rail and supporting and guiding said second travel block along the axis of said first movable guide rail; a U-frame attached to said second travel block and having a pair of parallel legs extending from the other side of said second travel block and said U-frame legs being spaced a predetermined distance apart and above said table surface; a pair of guide pins respectively extending perpendicularly from said U-frame legs; and a pair of spring means respectively attached to said U-frame legs;
- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box in optical communication with said light means; said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs;
- (h) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (i) a second step travel adjusting means comprising: a second rod connected to said second travel block and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
32. A graphic arts printer for the multiple exposure of a sensitized sheet to an image on a transparency, comprising in combination:
- (a) a rectangular table having a relatively flat rectangular top surface for supporting the sensitized sheet; alignment-guide-indicia by which the sensitized sheet is to be located adjacent to one corner of said table surface, said alignment-guide-indicia comprising a grid so arranged as to compensate for various sizes of transparencies and defining an X-axis and a Y-axis;
- (b) a rigid guide rail fixedly secured to the upper side of said table adjacent to one edge thereof and extending parallel to the X-axis, said guide rail being generally cylindrical in cross section and having a relatively flat top surface extending for a major portion of the length thereof, said guide rail extending substantially the length of said table; a stop member attached to the end of said rigid guide rail adjacent to said one corner to act as a reference;
- (c) a rigid carriage assembly comprising: a first travel block having a passage through which said rigid guide rail passes in slightly spaced relation to enable free movement of the block along the rigid guide rail parallel to the X-axis; offset rollers rotatably connected to the travel block and extending within the travel block and contacting the curved surface of the rigid guide rail and supporting and guiding the travel block therealong; first lock means connected to said travel block and including a relatively flat first brake shoe member positioned within said travel block facing said flat portion of said rigid guide rail, and including manual actuator means op-

- erative on said brake shoe member to stationarily lock said travel block in a preselected position on said rigid guide rail; projecting stop means extending from one end of said travel block; a guide plate movably engaging the upper side of said table adjacent to an edge opposite to said one edge thereof, first and second spaced parallel movable guide rails rigidly interconnecting said travel block and said guide plate and being movable therewith, said first movable guide rail extending parallel to the Y-axis and having a relatively flat top surface extending for a major portion of the length thereof;
- (d) a first travel stop block having a passage through which said fixed rigid guide rail passes to accommodate sliding movement of said first stop block along said first rigid guide rail parallel to the X-axis; second lock means connected to said first stop block and including a second relatively flat brake shoe member positioned within said first stop block facing said flat surface of said fixed rigid guide rail and further including manual actuator means so operative on said second brake shoe as to stationarily lock said first stop block in a preselected position on said fixed rigid guide rail; and second stop means projecting from one end of said first stop block toward and engageable with said travel block stop means;
- (e) a second travel stop block having a passage through which said first movable guide rail passes to accommodate sliding movement of said second stop block along said first movable guide rail parallel to the Y-axis; a third lock means connected to said second stop block and including a third relatively flat brake shoe member positioned within said second stop block facing said flat surface of said first movable guide rail and further including manual actuator means so operative on said third brake shoe as to stationarily lock said second stop block in a preselected position on said first movable guide rail; and third stop means projecting from one end of said second stop block;
- (f) a light-source support comprising: a second travel block having a passage through which said first movable guide rail freely passes, said second travel block being so movably mounted on said first movable guide rail as to enable free movement thereof parallel to the Y-axis; second offset rollers rotatably connected to said second travel block and extending within said second travel block and contacting a curved surface of said first movable guide rail and supporting and guiding said second travel block therealong, fourth lock means connected to said second travel block and including a fourth brake shoe member positioned within said second travel block facing said flat surface of said first movable guide rail and including manual actuator means so operative on said fourth brake shoe as to lock said second travel block in a preselected position on said first movable carriage rail; fourth projecting stop means extending from one end of said second travel block toward and engageable with said third projecting stop means; a guide rod extending from one side of said second travel block towards said second movable guide rail and so movably engaging the lower surface thereof as to limit rocking movement of said second travel block about the axis of said first movable guide rail; a U-frame attached to said second travel block and having a pair of parallel legs extending from a side opposite to said one side of said second travel block, and said U-frame legs being spaced a predetermined distance apart and above said table surface; a pair of guide pins respectively extending perpendicularly from said U-frame legs, and a pair of leaf springs respectively attached to said U-frame legs,

- (g) a light source comprising: a box enclosing an electrical exposure light means; a switch electrically connected to said light means; a jewel indicator supported on said box; in optical communication with said light means, said box having a lower translucent transparency support surface corresponding in size to said table alignment-indicia; a pair of angle frames respectively adjustably attached to opposite sides of said box; means defining a guide port in each angle frame slidably receptive of said guide pins with said angle frames supported on said leaf springs; and
- (h) a separate transparent alignment device for locating the transparency on said transparency support surface in a predetermined position comprising: a plate having indicia defining a second grid having spacing corresponding to that of said grid on said table, and a pair of pins secured to and extending from said plate, said pins having a size and spacing corresponding to that of said guide pins on said U-frame by which the transparency may be located with reference to a corner of the sensitized sheet;
- (i) a first step travel adjusting means comprising: a first rod connected to said first travel block and extending parallel to said fixed guide rail; a first apertured bracket extending from said first stop means and through the aperture of which said first rod extends; and first nut means adjustably fixed on said first rod to limit relative movement between said carriage assembly and said first stop means when only one of said first and second lock means is released; and
- (j) a second step travel adjusting means comprising: a second rod connected to said second travel block and extending parallel to said first movable rail; a second apertured bracket extending from said second stop means and through the aperture of which said second rod extends; and second nut means adjustably fixed on said second rod to limit relative movement between said second stop means and said light source support when only one of said third and fourth lock means is released.
33. A method of aligning a transparency on a translucent surface of a light source having a reference means for use with a graphic arts printer, comprising the steps of:
- providing an opaque sheet having a size at least as large as the translucent surface and having a grid thereon;
 - centering a transparency with respect to the grid of the opaque sheet;
 - removing a central portion of the opaque sheet within its grid so as to provide a mask extending around the periphery of the transparency; and
 - attaching the mask and centered transparency in fixed relation to the translucent surface with the grid in alignment with said reference means.
34. A method of aligning a transparency on a translucent surface of a light source for use with a grid on an easel with respect to which grid the light source is located, comprising the steps of:
- providing an opaque sheet having a size at least as large as the translucent surface and having a grid thereon corresponding to the grid of the easel;
 - centering a transparency with respect to the grid of the opaque sheet;
 - removing a central portion of the opaque sheet within its grid so as to provide a mask extending around the periphery of the transparency;
 - aligning the opaque mask and transparency assembly on the translucent surface with respect to the grid of the easel; and
 - attaching the mask and centered transparency assembly in fixed relation to the translucent surface.
35. A method of aligning a transparency on a trans-

lucent surface of a light source for use with a grid on an easel with respect to which grid the light source is located, comprising the steps of:

- providing an opaque sheet having a size at least as large as the translucent surface and having a grid thereon corresponding to the grid of the easel;
- centering a transparency with respect to the grid of the opaque sheet;
- removing a central portion of the opaque sheet within its grid so as to provide a mask extending around the periphery of the transparency;
- aligning the opaque mask and transparency assembly on the translucent surface with respect to the grid of the easel; and
- attaching the outer periphery of the mask and centered transparency assembly in fixed and optically sealed relation to the translucent surface.

36. A method of using a transparent alignment plate having a grid thereon for aligning a transparency on a translucent surface of a light source enclosure, having a reference means, with a corresponding grid on an easel, with respect to which grid the reference means is located, comprising the steps of:

- providing an opaque sheet having a size at least as large as the translucent surface and having a grid thereon corresponding to the grid of the easel;
- centering a transparency with respect to the grid of the opaque sheet;
- removing a central portion of the opaque sheet within its grid so as to provide a mask extending around the periphery of the transparency;
- locating the alignment plate on the enclosure with the plate grid aligned with the enclosure reference means and disposed adjacent to the translucent surface;
- inserting the opaque sheet and centered transparency assembly between the translucent surface and the alignment plate;
- aligning the grid of the opaque sheet with the plate grid to locate the transparency with respect to the reference means;
- attaching the opaque sheet and centered transparency assembly in fixed relation to the translucent surface;
- removing the alignment plate from the enclosure.

37. A method of using a transparent alignment plate having a grid thereon for aligning a transparency on a translucent surface of a light source enclosure, having a reference means, with a corresponding grid on an easel, with respect to which grid the reference means is located, comprising the steps of:

- providing an opaque sheet having a size which will substantially cover the translucent surface and having a grid thereon corresponding to the easel grid;
- attaching the transparency to the sheet centrally of the grid of the opaque sheet;
- removing a central portion of the opaque sheet within its grid so as to provide a mask extending around the periphery of the transparency;
- locating the alignment plate on the enclosure with the plate grid aligned with the enclosure reference means and disposed adjacent to the translucent surface;
- inserting the opaque sheet and centered transparency assembly between the translucent surface and the alignment plate;
- aligning the grid of the opaque sheet with the plate grid to locate the transparency with respect to the reference means;
- attaching the outer periphery of the opaque sheet and centered transparency assembly in fixed and optically sealed relation to the translucent surface;
- removing the alignment plate from the enclosure.

38. A method of using a transparent alignment plate having guide means and having a grid thereon for align-

ing a transparency on a translucent surface of a light source enclosure having a guide means coactive with the plate guide means, with a corresponding grid on an easel with respect to which easel grid the guide means of the enclosure is located, comprising the steps of:

- (a) providing an opaque sheet having a size which substantially covers the translucent surface and having a grid thereon corresponding to the easel grid;
- (b) attaching the transparency to the sheet centrally of the grid of the opaque sheet;
- (c) removing a central portion of the opaque sheet and grid so as to provide a mask extending around the periphery of the transparency;
- (d) locating the guide means of the alignment plate on the guide means of the enclosure to align the plate grid therewith and disposed adjacent to the translucent surface;
- (e) inserting the opaque sheet and centered trans-

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parency assembly between the translucent surface and the alignment plate;

- (f) aligning the remainder of the grid of the opaque sheet to align the transparency with both of the guide means;
- (g) taping the entire outer periphery of opaque sheet and centered transparency assembly in fixed relation to the enclosure to maintain its alignment and to seal optically the entire outer periphery of the assembly to the enclosure; and
- (h) removing the alignment plate from the enclosure.

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