Sept. 21, 1954 W. F. HUCK 2,689,411

METHOD AND MEANS FOR REGISTERING A SERIES OF COLOR PRINTING PLATES

Filed May 28, 1948

3 Sheets-Sheet 1

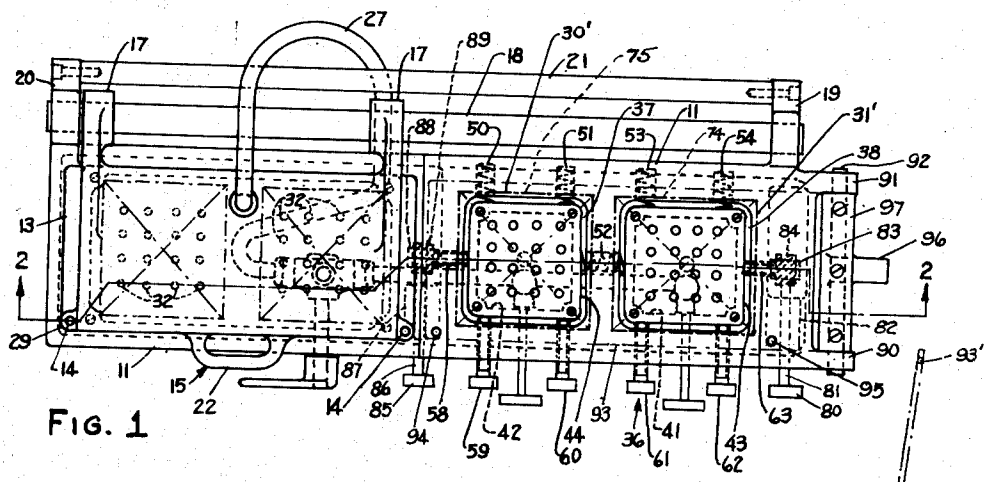


FIG. 1

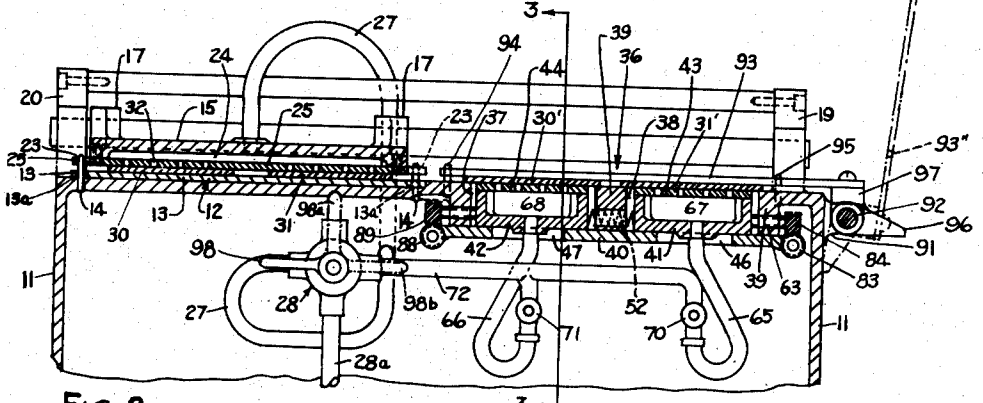


FIG. 2

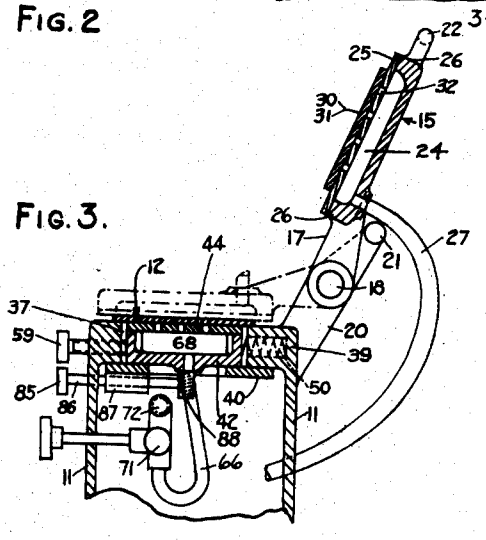


FIG. 3.

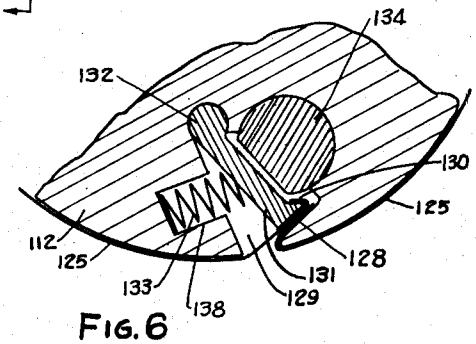


FIG. 6

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METHOD AND MEANS FOR REGISTERING A SERIES OF COLOR PRINTING PLATES

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3 Sheets-Sheet 2

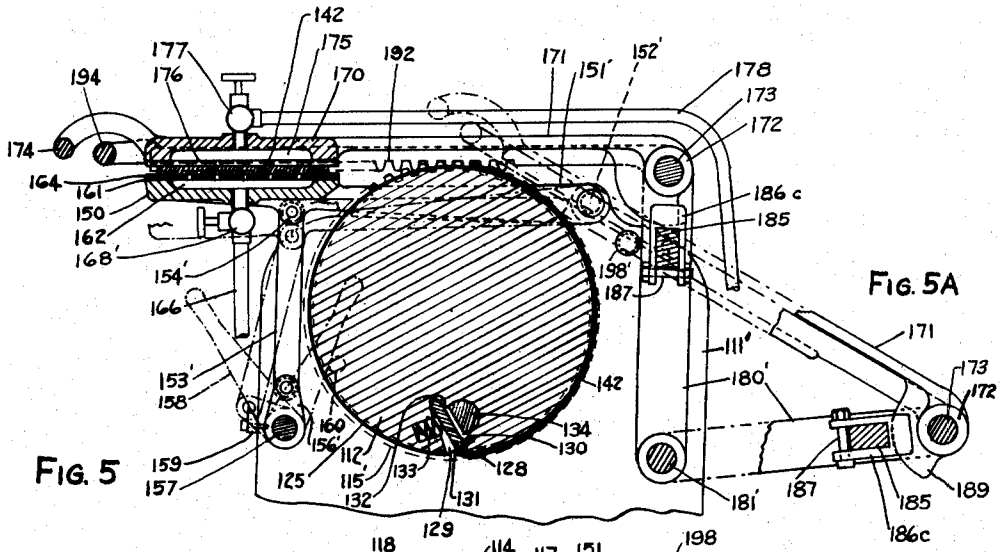


FIG. 5

FIG. 5A

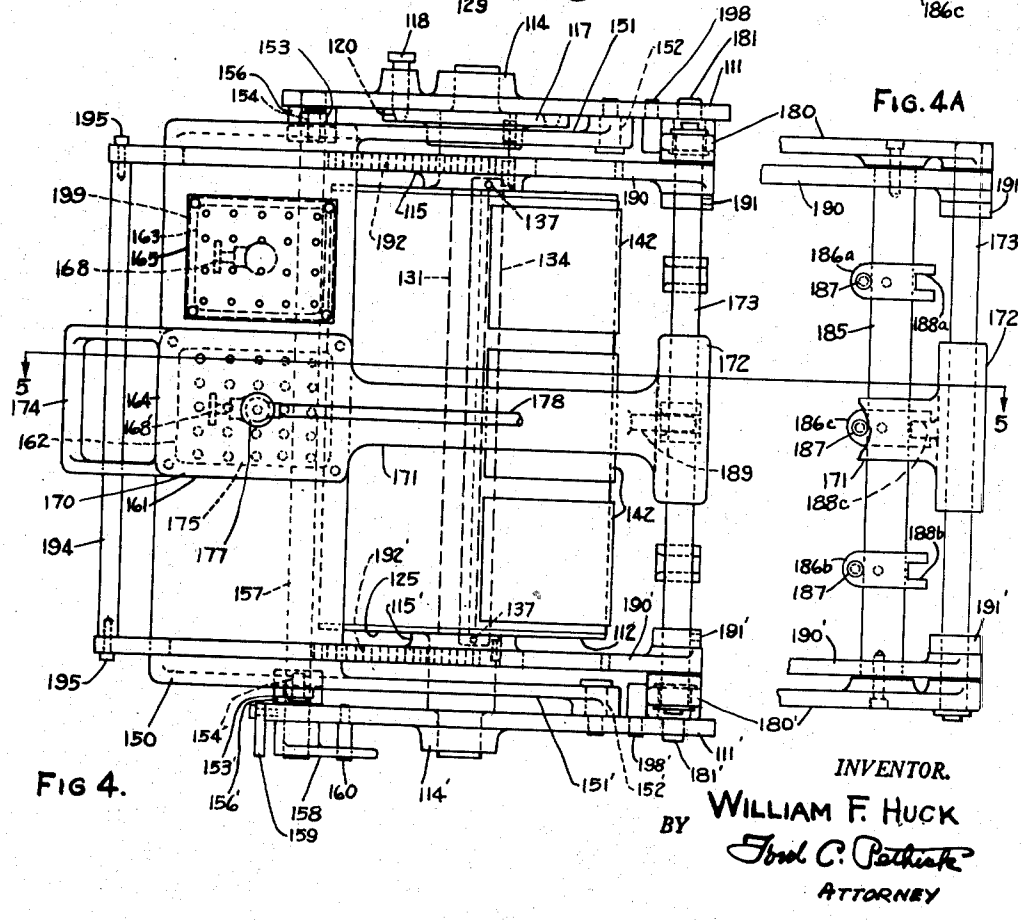


FIG. 4.

FIG. 4A

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METHOD AND MEANS FOR REGISTERING A SERIES OF COLOR PRINTING PLATES

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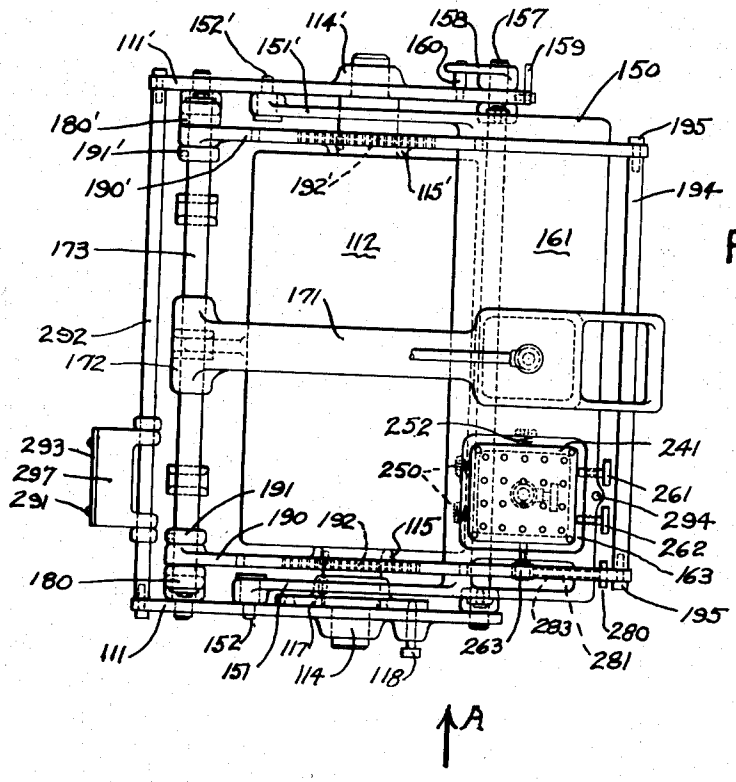


FIG. 7.

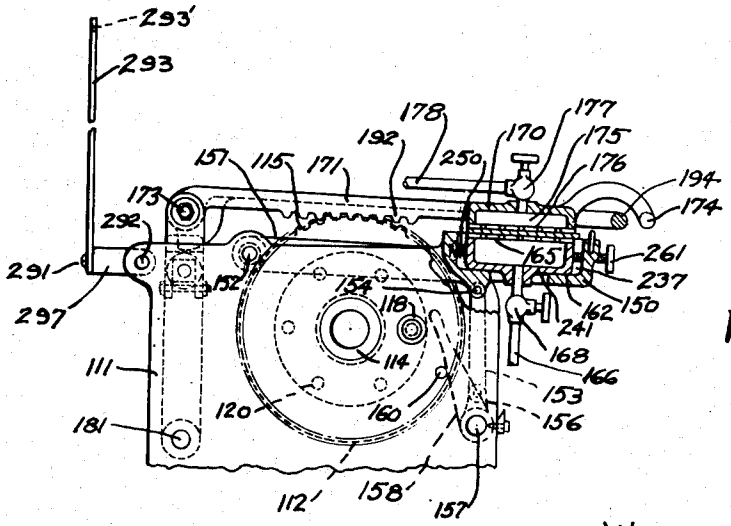


FIG. 8.

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Patented Sept. 21, 1954

2,689,411

UNITED STATES PATENT OFFICE

2,689,411

METHOD AND MEANS FOR REGISTERING A SERIES OF COLOR PRINTING PLATES

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Application May 28, 1948, Serial No. 29,858

22 Claims. (Cl. 33—184.5)

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This invention relates to printing, more particularly to a method of and means for registering a series of color printing plates.

In multi-color printing, such as for example in the printing of the color section of a Sunday newspaper, it is common practice to print two or more colors on the same sheet of paper and in the same location. In order that the finished product shall present a pleasing and artistic appearance, it is necessary that all the colors be accurately positioned with respect to one another. If the printing is to be done with four colors, the printer in order to obtain one multi-colored picture may apply, in series or in succession, a printing of yellow ink, then a printing of red ink, then a printing of blue ink, and finally a printing of black ink all on the same paper. This requires four separate and different printing plates, each plate being used in succession to apply a different colored ink to the single sheet or web of paper or other material. All of the four plates must be accurately registered, in order that an artistic and saleable picture will result.

Some printing machines use flat printing plates and other machines use curved printing plates mounted on a printing cylinder. This invention is directed to both types of printing plates and the instant invention has for one of its primary objects the provision of a new and improved method and means for accurately positioning or registering a succession of printing plates so that extremely accurate multi-colored printing can be produced.

In printing newspapers, magazines and many other articles, it is essential that the time required for the various operations be held to an absolute minimum. This is especially true when printing colored newspaper sections and colored magazines. Therefore, another primary object of the invention is to provide an extremely fast as well as an accurate method and means for registering printing plates used for multi-colored printing.

Another object of the invention is to provide a method and means for registering flexible plates, as for example rubber plates.

A still further object of the invention is to provide a new and improved method for mounting or holding printing plates to a form once they have been properly registered with respect to that form.

Other and further important objects of this invention will become apparent from the following detailed description and appended claims.

For a more complete understanding of this invention, reference should be made to the accompanying drawings which form a part of this specification and in which:

Fig. 1 is a plan view of a first preferred device embodying this invention and arranged for registering and mounting flat printing plates;

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Fig. 2 is an elevational sectional view taken substantially along the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is an elevational sectional view taken substantially along the line 3—3 of Fig. 2, but showing the cover member of the device in a raised position;

Fig. 4 is a plan view of a second preferred embodiment of this invention, the device being arranged for registering and mounting curved printing plates;

Fig. 4–A is a plan view of a portion of the mechanism similar to Fig. 4, but with parts shown in a different position.

Fig. 5 is an elevational sectional view taken substantially along the line 5—5 of Fig. 4 and looking in the direction of the arrows; and

Fig. 5–A is an elevational sectional view of a portion of the mechanism similar to Fig. 5, but with parts shown in a different position;

Fig. 6 is an enlarged sectional view showing details of a portion of the mechanism shown in Fig. 5;

Fig. 7 is a slightly modified form of the device shown in Fig. 4; and

Fig. 8 is a view, partly in section, of the device shown in Fig. 7 as seen in the direction of the arrow A.

Referring to the drawings, this invention is shown in one form in Figs. 1, 2 and 3, as applied to a device for registering and mounting flat printing plates, and comprises a frame structure 11, having a flat table top 12 at its left side, as seen in Figs. 1 and 2. The table top 12 is provided with a plurality of accurately located and firmly embedded upstanding registering pins 14, and a flat mounting plate 13 is removably carried on the table-top 12, the pins 14 being used to engage registering apertures 13a accurately located in the mounting plate 13. This arrangement makes it possible to accurately position the plate 13 on the table-top 12.

An upper or top transfer suction box 15 is provided with a pair of rearwardly extending spaced arms 17 that are pivotally or hingedly carried on a horizontally extending shaft 18 that is supported from the frame 11 by a pair of spaced rearwardly inclined brackets 19 and 20. The brackets 19 and 20 extend beyond the shaft 18 and thereby carry a horizontally extending bumper bar 21 against which the arms 17 rest when the cover member 15 is in the raised position as shown in Fig. 3. The distal end of the suction box 15 is provided with a handle 22 by which the cover can be moved from the position shown in Fig. 2 to the position shown in Fig. 3 and vice versa. The vacuum or suction box 15 comprises a perforated bottom-plate 25 which is tightly held, as by screws, to the under side of a down facing concave casting 26. The plate 25

is provided with a pair of ears 29 (Fig. 1) each of which has a registering hole 23, which, when the suction box 15 is moved to the lowered position shown in Figs. 1 and 2, are arranged to engage the pins 14. The plate 25 may also have a suitable seal (not shown) around its lower surface, so better to hold the printing plates 31 and 30 by vacuum.

The concavity of the casting 26 provides a suction or vacuum chamber 24, which is connected by means of a flexible hose 27 to one outlet of a four-way valve 28 which through another outlet is connected by a pipe 28a to a vacuum or exhaust pump (not shown). It will be understood that vacuum or suction acting through perforations 32 in the plate 25 is capable of holding a pair of printing plates 30 and 31 against the lower or outer surface of said plate 25, it being understood that the upper surface of the printing plates may be the surface that does the printing when the plates are used. This will be more fully described hereinafter.

The entire suction box assembly 15 is not only hinged on the shaft 18, but can also be slid axially along the shaft 18, thus making it possible to move the suction box assembly from a position toward the left side of Fig. 1 to a position toward the right side and vice versa.

A heavily constructed right top 36 of the frame 11 has a pair of rectangular apertures or openings 37 and 38 which are separated by a heavy intermediate top section 39. A bottom plate 40 is secured by means (not shown) to the under side of the parts 36 and 39, and this plate 40 has a pair of apertures 46 and 47 which accommodate a downwardly projecting portion of a pair of hollow members or up-facing suction boxes 41 and 42 each of which is respectively covered by a perforated top-plate 43 and 44 which are tightly held in place, as by screws. Reference to the drawings will show that the boxes 41 and 42, in their horizontal dimensions, are smaller than the openings 37 and 38. It will also be noted that the total height of the box 41 (also 42) plus its cover plate 43 (44) is equal to the distance from the top of the plate 40 to the top of the side 36. The boxes 41 and 42 can be moved forward, backward, side-wise and rotated in the openings 37 and 38.

The boxes 41 and 42 are held in place and adjustably moved by micrometrical and backlash-free means now to be described. The hollow box 42 is engaged on its rear by a pair of compression springs 50—51 and on its right side by a spring 52. The hollow box 41 is likewise engaged on its rear by springs 53—54 and on its left side by by the spring 52. The box 42 is engaged on its left by an adjusting screw 58 and on its front by a pair of spaced adjusting screws 59 and 60; the box 41 is likewise engaged on its right by a screw 63 and on its front by screws 61 and 62. The right box has a hose 65 connected to its bottom and extending through the aperture 46, and the box 42 likewise has a hose 66, both of the hoses 65 and 66 being connected respectively through valves 70 and 71 and a common pipe 72 to an opening of the valve 28 and thence to a vacuum pump (not shown). Thus, when suction is applied to the cavity of box 41 and/or 42 printing plates 30' and/or 31' will be held respectively to the perforated covers 44 and/or 43; it being understood that these plates 30' and 31' later take the position of the plates 30 and 31.

The suction box 41 can be adjusted slightly to the left or right in the opening 38, by the use of a small hand wheel 80 carried at the front end of a shaft 81 and that is journaled in a bearing 82 carried by the bottom plate 40. The rear end of the shaft 81 carries a helical gear 83 that drivingly engages a helical gear 84 that is formed on one end of the screw 63. The screw 63 is threaded through the heavy section 39 and by pressing against the side of the box 41 is able to compress the spring 52. The box 41 can thus be moved from left to right and back again by operation of the handle 80. The box 41 can also be moved from front to rear and from rear to front by operation of the screws 61 and 62 which counteract against the pressure of the springs 53 and 54 respectively. It will be noted that limited rotation of the box 41 in the opening 38 is possible by turning screw 61 in and screw 62 out or vice versa. Thus the box 41 with its vacuum held printing plate 31' can be shifted in any direction and rotated within the limits of the device and at the same time remain locked to cover 43 of the box 41. The suction box 42 is similarly moved from right to left by means of a hand wheel 85 and a shaft 86. The shaft 86 is journaled in a bearing 87 and by means of intermeshing helical gears 88 and 89 rotates the screw 58, thereby compressing or relaxing the spring 52 as the suction box 42 moves. Also, in a manner similar to that previously described for screws 61 and 62, the screws 59 and 60 cause motion of the suction box 42 against the compression springs 50 and 51.

The right side of the frame 11 has a pair of spaced hinge brackets 90 and 91 which support opposite ends of a shaft 92. The shaft 92 acts as a pivot for a support bracket 97, which bracket pivotally supports a suitable gage plate or transparency 93. The transparency 93 has a pair of spaced registering holes or apertures 93' and 93'', which when the transparency is in the lowered position shown by solid lines in Fig. 2, engage a pair of registering pins 94 and 95, the former being located toward the left front and the latter being located toward the right front of the heavy section 39. Thus the transparency will be accurately located when it is in the lowered or down position shown in Fig. 2. The transparency is supported by a lug 96 when it is in the raised or "dash-dot" position of Fig. 2. The transparency 93 has marks on its lowermost side which are similar to and can be made to match or register with similar marks that are carried by the printing plates 30' and 31'. In Fig. 1 these marks on the transparency are indicated by the numerals 74 and 75 and are the outlines of the outside limits of the printing plates 31' and 30', although it will be understood that any other suitable matching or register marks may be used.

The valve 28 has an operating handle 98, which may assume any one of three positions. When the handle 98 is vertical as shown by dotted lines 98a (Fig. 2), the valve is closed and the suction of pipe 28a is blocked. When the valve 98 is to the left as indicated by solid lines, vacuum is applied to the hinged suction box 15, and when the handle is to the right as indicated by 98b, suction is applied to either or both of the suction boxes 41—42, depending on the condition of the valves 70—71.

The method of operation of the above described device is as follows: At the beginning of the operation the suction boxes 41 and 42 will, by means of the screws 59, 60, 61, 62 and hand wheels

80 and 85, be roughly centered in the openings 38 and 37 respectively. Then the pair of printing plates 30'—31', which are to be operated upon by the machine of this invention, will be placed on and in rough alignment with the perforated plates 43—44 of the boxes 41—42. When this has been accomplished, the valves 70 and 71 are opened and the handle 98 of the valve 28 is moved to the right position 98b. This causes suction or vacuum to hold the plates 30' and 31' firmly on the cover plates 44 and 43 respectively. Then the transparency 93 is lowered to the position shown by solid lines in Fig. 2, and is registered by means of matching holes 93'—93'' and pins 94—95. The transparency 93 will rest lightly on the plates 30' and 31' so that an error between the outline edges of the plates and the outline marks on the under surface of the transparency can be observed. Then the screws 59, 60, 61, and 62 and the hand wheels 80 and 85 are manipulated in such a manner as to move the printing plates so that their outline edges exactly correspond with the outline marks carried by the transparency. When the printing plates are properly positioned, the transparency 93 is raised, and the transfer member or suction box 15 is moved to the right by sliding along the shaft 18. Finally the suction box 15 is lowered over the printing plates 30'—31' with its perforated plate 25 downfacing, care being taken to make sure that the holes 23 in the plate 25 register with the pins 94—95 carried by the heavy top 36. Turning the lever 98 to the left position 98 will disconnect the vacuum from the suction boxes 41 and 42 and transfer the pull of the vacuum to the suction box 15. Then the member 15, and the printing plates 30'—31' held thereto, are raised by means of the handle 22, and when raised are transferred to the left portion of the frame 11 by sliding the member 15 along the shaft 18. While in the raised position, the backs of the printing plates are exposed and will receive a suitable adhesive application for cementing it to a surface as follows. Thereafter the member 15 is lowered until the printing plates (now designated as 30 and 31) rest on the upper surface of the removable mounting plate 13. In doing this care should be taken to see that the holes 23—23 in the plate 25 register with the pins 14. As soon as the plates 30—31 are in position on the plate 13 the handle of valve 28 is moved to the position 98a thus removing all suction from the plates. Then the suction box 15 can be elevated to the position shown in Fig. 3, and the plates 30—31 remain firmly and accurately glued to the removable plate 13. When this has been done, the plate 13 and the plates 30—31 carried thereby can be removed from the table-top 12 for use in a multi-color printing which need not here be described in detail. If we assume that the above described operation was performed on a set of printing plates that eventually will be used to print yellow, it will be necessary to repeat the operation for other sets of printing plates as for example plates that will eventually print red, blue and perhaps black. In any event, those versed in the printing art will appreciate the fact that the above series of color printing plates will all be in register and suitable for use in multi-color printing.

It will be noted that I have shown a device for handling two printing plates 30 and 31 at the same time. However it will be understood that a device for handling one, three or more plates can be constructed in accordance with the teaching of my invention.

A second preferred embodiment of the invention is shown in Figs. 4, 4a, 5, 5a, and 6, which illustrate a device for registering and mounting curved printing plates. This device or machine comprises a pair of spaced side frames 111 and 111' between which a cylinder 112 is rotatably supported in bearings 114 and 114'. To each end of the cylinder there is keyed a gear, these being designated 115 and 115', and to one end of the cylinder, adjacent frame 111, there is keyed an index disk 117. A cone-tipped locating pin 118 is carried by the frame 111 and when entered into any one of a plurality of holes 120 formed in the disk 117 provides a means for accurately positioning the rotating index disk and thus the cylinder 112.

A flexible curved mounting plate 125 is tightly fixed or clamped around the outer surface of the cylinder 112. This is accomplished by having one end of the curved plate 125 bent into a hook 128 (Fig. 6) which engages a suitably shaped edge of a cut-out or recess 129 which extends the full length of the cylinder 112. The other end of the plate 125 is likewise hooked as at 130 and for the full length of the cylinder enters the recess 129. The hook 130 is held in place by a clamp 131 positioned in the recess 129 and fulcrumed at 132.

At intervals along the length of the clamp 131 and the cylinder 112 there are spaced a plurality of compression springs 133 located in pockets 138 formed in the cylinder 112. These springs bias the clamp 131 counterclockwise (as seen in Fig. 5) about the fulcrum 132. A D-shaped shaft 134, journaled in the cylinder 112 adjacent the clamp 131 can be rotated by a removable bar or other tool (not shown) placed into a hole 137 formed in either one or both of the protruding ends of the D-shaped shaft 134. When the D-shaped shaft 134 is rotated ninety degrees (90°), from the position shown in Fig. 5, the curved portion of the shaft swings the clamp 131 clockwise against the springs 133 and causes the clamp to release the hooked end 130 of the plate 125. While I have provided one means for clamping the plate 125 to the cylinder, it will be understood that I am not limited to this particular means as other types of clamping means may be employed.

A suction box shelf 150 is supported on the free or distal ends of a pair of spaced substantially horizontal arms 151 and 151' which have their other ends pivotally mounted on a pair of fulcrum studs 152 and 152', respectively, carried by the frames 111 and 111'. The suction box shelf 150 is prevented from uncontrolled downward movement by a pair of upstanding links 153—153', the upper ends of the links 153—153' respectively being pivotally connected to the arms 151—151' by pins 154—154'. The lower ends of the links 153—153' are pivotally attached to the distal ends of a pair of crank levers 156—156' which are fixed to opposite ends of an operating cross shaft 157, opposite ends of which are journaled in the frames 111—111'. One end of the shaft 157 extends beyond the frame 111' and there has an operating lever 158 fixed to it. Movement of the lever 158, and thus the shaft 157, is limited by studs or pins 159 and 160 protruding from the outer face of the frame member 111'. When the handle 158 is turned to the right, as seen in solid lines in Fig. 4 and in the right hand dash lines in Fig. 5, the suction box shelf 150 is in the elevated or raised position, and when the handle 158 is moved to the left

(Fig. 5), shown in dash-dot lines, the suction box shelf 150 is in the lowered position.

The shelf 150 has a substantially flat table-top 161 provided with a pair of up facing depressions or suction caviites 162 and 163, the cavities respectively being covered by perforated plates 164 and 165 which are held in place by screws. Cementing tape, with its protective covering down, may be firmly sucked against plate 165 and trimmed to size around its edge. The bottom of each cavity is connected to a valve 168 and 168' and the two valves are connected by a common pipe 166 to an exhaust pump or vacuum source not shown.

The registering and mounting device is also provided with a top down-facing suction box 170 having a handle 174. The suction box 170, as will presently be explained, may be raised above or lowered substantially onto the table top 161 of the shelf 150. The top suction box 170 may also be moved to several different selected positions crosswise of this shelf. In order to be movably mounted the top suction box 170 is formed as part of the distal end of a support arm 171 which is hinged by means of a long guide bearing 172 on a cross shaft 173. The box 170 has a down-facing suction cavity 175 covered by a perforated plate 176 which is held in place by screws. The suction cavity, by way of a valve 177 is connected to a flexible hose 178 which in turn is connected to a source of vacuum (not shown). Opposite ends of the shaft 173 are fastened to the distal ends of a pair of spaced levers 180 and 180', the other ends of which are fulcrumed about studs 181 and 181' respectively carried by the frames 111 and 111'. A cross bar 185 has its opposite ends bolted to portions of the levers 180—180' at locations close to the shaft 173. The cross bar 185 carries a plurality of, in this case, three spaced locating brackets 186*a*, 186*c*, and 186*b*. Each of these brackets is clamped to the bar 185 by a bolt 187, and each bracket has a registering notch 188, any one of which, under certain conditions, may be engaged by registering lug 189 depending from an under part of the guide bearing 172. The notches 188 and the lug 189 provide a means for accurately locating the arm 171 and therefore the top suction box 170 in a plurality of positions crosswise the table-top 161.

Reference to Figs. 4A and 5A will show that the arms 180 and 180' and the arm 171 may assume an extended position in which the arms 180—180' pivot clockwise about the studs 181—181' and in which the arm 171 "jack-knifes" on the shaft 173.

Shaft 173, in addition to being attached to arms 171, also carries spaced arms 190 and 190' which by means of collars 191 and 191' are confined against movement along the shaft 173. A mid-portion of each of the arms 190—190' is respectively formed with a rack of depending teeth 192 and 192', which engage upper convex portions of the gears 115 and 115' respectively. The free or distal ends (left portion of Figs. 4 and 5) are joined by a handle bar 194 held in place by bolts 195 thus making it necessary to move the arms 190 and 190' as a unit. The counter clockwise movement of the arms 180 and 180' about the shaft 181 is limited by studs 198 and 198' which are mounted on frames 111 and 111'.

The mechanism of Figs. 4 and 5 for registering and mounting curved printing plates operates in the following manner. It will be assumed that the curved mounting plate 125 has previously been secured to the cylinder 112 by means of the hereinbefore described clamp 131 or by another suitable clamping device. It will be further assumed that there are a plurality of flat flexible printing plates 142 that are to be accurately cemented to the said curved mounting plates 125. To start, a flat printing plate, with its printed face uppermost, is accurately placed in a central location on the table-top or shelf 150 and registered with suitable marks on a transparency 293 (Fig. 8) which may be located accurately with respect to the edges of perforated plate 164. This is similar to the method of using the transparency 93 shown in Figs. 1 and 2, in which pins are employed to register the transparency. Furthermore, if desired the table-top or suction box shelf 150 may be fitted with a plurality of adjusting screws and springs similar to the screws 59, 60 and 85 and springs 50, 51 and 52 shown in Fig. 1. These features, as applied to the second preferred embodiment of the invention, are illustrated in Figs. 7 and 8 which show a transparency 293 held by screws 291 to a U-shaped bracket 297 which is pivotally mounted on a shaft 292 supported by the rear ends of the side frames 111 and 111''. The free end of the transparency 293 is provided with a register hole 293' which cooperates with a register pin 294 carried by the shelf 150. Also as illustrated in Figs. 7 and 8, the shelf 150 is provided with a rectangular opening 237 which accommodates a movable suction box 241. The box 241 is held in place and adjustably moved by a micrometrical and back lash free means similar to that shown in Figs. 1 and 2 and comprising compression springs 250 engaging the rear of the box 241 and a compression spring 252 engaging the side of the box. The box 241 is engaged on one side by a screw 263 and on its front by screws 261 and 262. The box 241 can be adjusted slightly to the left or right by the use of a small hand wheel 280 carried on the front of a shaft 281. The rear end of the shaft 281 carries a pair of helical gears 283 which drive the screw 263.

When the printing plate is accurately placed, the valve 168' is opened to apply suction to the under surface of the printing plate 142. The register transparency is removed and the printing plate may be trimmed around its edges flush with the perforated plate 164. Then the upper suction box 170 is placed on top of the printing plate 142, as it lies on the perforated plate 164, it being noted that the position assumed by the suction box 170 is accurately governed by the racks 192—192' engaging the gears 115—115' and by the lug 189 engaging the notch 188*c*. When the upper box is in place, the valve 168' is closed and valve 177 is opened. This transfers the suction grip of the printing plate from the lower to the upper suction box. In the meantime, or anytime before the next described operation, a sheet of adhesive 199 is placed on the upper surface of the perforated plate 165 with the protected side down. This adhesive sheet 199 is held to the table-top by suction controlled by the valve 168 and while so held the edges are trimmed to size. Then the upper suction box 170 is lifted sufficiently to disengage the lug 189 from the notch 188*c*, and the upper suction box is moved until the lug 189 engages the notch 188*a*. This aligns the printing plate 142 with the adhesive 199 on the perforated plate 165, and when the plate 142 is lowered to rest on the adhesive it adheres to the under surface of the printing plate 142. Then the valve 168 is opened and the upper suction box

is raised to a point where the protective coating can be and is removed from the bottom surface of the adhesive 199. These operations have prepared the printing plate 142 for cementing to the curved mounting plate 125 carried on the cylinder 112, which operation will now be described. First the table-top 150 is lowered out of the way by moving the arm 158 from right to left as seen in Fig. 5. Then the upper suction box and the printing plate carried thereby are moved to one of three selected positions axially of the cylinder 112; these three positions being determined by the engagement of the lug 189 with a selected one of the notches 188*a*, 188*c* or 188*b*. Next the pin 118 is removed, and with firm downward pressure on the handle 174 the upper suction box 170 is moved from the left of Figs. 4 and 5 to right thereof. This, due to the engagement of the racks 192—192' with the gears 115—115', rotates the cylinder 112 in a clockwise direction and, due to the adhesive on the lower surface of the printing plate 142, this plate is peeled off the upper suction box and adheres to the curved mounting plate 125. This results in the printing plate being rolled into exact placement on the curved mounting plate 125.

With certain types of adhesives the procedure may be to trim the adhesive that has both surfaces protected and is held by suction to perforated suction plate 165, then transferring it to the suction box 170 in accurate register, then removing the lower protective covering as box 170 is raised, then placing box 170 with the transparency in its desired location and by rolling it against the mounting plate, peeling it off box 170 and accurately transferring it to the mounting plate. Now the top protective layer is removed and the printing plate may be cemented on top of the adhesive in a similar manner.

As soon as one printing plate has been properly glued to the mounting plate, the handle bar 194 is raised, and as it is raised it engages the handle 174. Raising of the two handles disengages the racks 192—192' from the gears 115—115'. This allows the cylinder 112 to be turned to a new selected location, the exact position of which is determined by the pin 118 accurately engaging one of the holes 120 in the index plate disk 117.

The above operation is then repeated for each successive printing plate 142 until all desired printing plates are glued to the cylinder 112 in desired locations. When this is accomplished, the clamp 131 is unlocked and the mounting plate 125 is removed from the cylinder 112. The mounting plate is now ready for placement on a printing cylinder of a rotary printing machine.

It will be understood that a series of mounting plates, similar to the mounting plate 125 can be accurately placed on the above described machine, and when so placed the series of mounted plates can be used to apply a series of color impressions to a web of paper in a manner similar to the way the series of mounted flat printing plates are used.

Although not shown in the drawings, all of the suction boxes preferably are encircled with a resilient sealing strip, such as for example a soft rubber strip or a strip with feathered edge. This makes it possible for the various suction boxes to grip various kinds of printing plates even though the surface of the plate may be irregular. It will also be understood that the suction boxes may be replaced by suitable adhesives to hold, lift, and transfer plates from one location to another accurately.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A registering device for registering and mounting a series of printing plates comprising a frame, an up-facing suction box supported by said frame, said up-facing suction box having a perforated cover for gripping the lower surface of said printing plate, a down-facing suction box supported by said frame, said down-facing suction box having a perforated cover for gripping the upper surface of said printing plate, means for exhausting air from both of said suction boxes, means for moving said down-facing suction box from a position above said up-facing suction box to a location apart from said up-facing suction box, means for registering said down-facing suction-box with respect to said up-facing suction-box.

2. A registering device for registering and mounting a series of multi-color printing plates comprising a support, an up-facing suction box carried by said support, said up-facing suction box having a perforated cover for gripping the lower surface of said printing plate, adjustable devices for moving said suction box with respect to said support, a down-facing suction box carried by said support, said down-facing suction box having a perforated cover for gripping the upper surface of said printing plate, and means for moving said down-facing suction box and the printing plate held thereby.

3. A registering device for registering and mounting a series of multi-color printing plates comprising a flat table-top, an up-facing suction box supported by said flat table-top, said up-facing suction box having a perforated cover for gripping the lower surface of a printing plate, a conveying member extending along said table-top, a down-facing suction box pivotally and slidably mounted on said conveying member, said down-facing suction box having a perforated cover for gripping the upper face of a printing plate, vacuum pipes connected to each of said suction boxes arranged to exhaust them, and a mounting plate positioned on said table-top, and means for registering said down-facing suction box with respect to said up-facing suction box.

4. A registering device for registering and mounting a series of multi-color printing plates comprising a flat table-top, an up-facing suction box adjustably supported by said table-top, at least one adjusting screw arranged to move said suction box with respect to said table-top, a down-facing suction box pivotally and slidably mounted with respect to said up-facing suction box, exhausting pipes and valves arranged to exhaust said suction boxes, and means for registering said down-facing suction box with respect to said up-facing suction box.

5. A registering device for registering and mounting a series of multi-color printing plates comprising a frame structure, a pair of up-facing suction boxes adjustably supported by said frame, a perforated plate secured to the top of each of said suction boxes, a plurality of adjusting screws carried by said frame and engaging said suction boxes, a plurality of resilient members opposing said screws, a down-facing suction box pivotally and slidably mounted with respect to said frame, said down-facing box being of sufficient size to cover both of said up-facing suction boxes, a perforated plate secured to said down-facing suction box, a plurality of registering pins carried by said frame and arranged to register said down-facing suction box, a table-top carried by said frame, a plurality of registering pins carried

by said table-top and arranged to register a mounting plate and said down-facing suction box on said table-top, and means for selectively exhausting said boxes.

6. A device for registering and mounting a series of multi-color printing plates comprising a support frame, a suction plate gripping device carried by said support frame, said gripping device having a perforated cover for gripping the lower surface of a printing plate, a second suction plate gripping device carried by said support frame and movable to a position above said first gripping device, said second gripping device having a perforated cover for gripping the upper surface of a printing plate, means for alternately causing said suction gripping devices to grip said plate, means for registering said second suction plate gripping device with respect to the suction plate gripping device carried by said support frame and means for moving said second suction plate gripping device from a position above said first plate gripping device to a location apart therefrom.

7. A device for registering and mounting a series of multi-color printing plates comprising a support, an up-facing suction plate gripping device carried by said support, said up-facing suction plate gripping device having perforations for gripping the lower surface of a printing plate, adjustable devices for moving said plate gripping device with respect to said support, a second suction plate gripping device carried by said support, said second suction plate gripping device having perforations for gripping the upper surface of the said printing plate, and means for moving said second gripping device and the printing plate gripped thereby.

8. A device for registering and mounting a series of multi-color printing plates comprising a flat table-top, an up-facing suction box adjustably supported by said table-top, a transparency positionable upon said suction box, at least one adjusting screw arranged to move said suction box with respect to said table-top and into register with said transparency, a down-facing suction box pivotally and slidably mounted with respect to said up-facing suction box, exhausting pipes and valves arranged to exhaust said suction boxes, means for registering said down-facing suction box with respect to said up-facing suction box.

9. A device for registering and mounting a series of multi-color printing plates comprising a support frame, at least one up-facing gripping means adjustably supported by said frame, a plurality of adjusting means carried by said frame and engaging said gripping means, a registering means positionable upon said up-facing gripping means, a plurality of resilient members opposing said adjusting means, a down-facing gripping means pivotally and slidably mounted with respect to said frame, a plurality of registering pins carried by said frame and arranged to register said down-facing gripping means, a table-top carried by said frame at a point remote from said up-facing gripping means, a plurality of registering pins carried by said table-top and arranged to register a mounting plate and said down-facing gripping means, and means for selectively causing said gripping means to grip the plates.

10. A device for registering and mounting a series of multi-color printing plates, comprising a first up-facing suction box arranged to grip one side of a printing plate, a pair of spaced pivotally mounted arms the distal ends of which are arranged to support said first suction box, means for raising and lowering the distal ends of said arms and said suction box, a second down-facing suction box arranged to grip the other side of said printing plate, means for moving said down-facing suction box into a plurality of selected positions, one of said positions being substantially above said up-facing suction box, a rotatably carried cylinder, means for indexing said cylinder, a flexible mounting plate secured to the surface of said cylinder, a gear secured to said cylinder, a rack engagable with said gear and secured to said means for moving said down-facing suction box, and adhesive for securing the printing plate held by said down-facing suction box to said mounting plate.

11. A device for registering and mounting a series of multi-color printing plates, comprising a plate gripping device arranged to grip the lower surface of a printing plate, means for raising and lowering said plate gripping device, a second plate gripping device arranged to grip the upper surface of the printing plate, a means for moving said second plate gripping device, a rotatable cylinder mounted adjacent said gripping device, a pair of gears rotatable with said cylinder, a pair of racks connected with said second plate gripping device and respectively engageable with said gears, pivotally mounted levers connected with said racks, a handle for moving said racks and said second plate gripping device in unison with said gears and cylinder, and adhesive securing said plate to said cylinder as the plate and cylinder are moved in unison.

12. A process for registering and mounting a plurality of flexible printing plates which comprises placing a flexible printing plate upon a first flat surface, lowering a second flat surface over said printing plate, securing said printing plate to said second surface, moving said second surface and said printing plate to a location remote from said first surface, placing adhesive on the lower surface of said printing plate while it is being held by said second surface, rolling said flexible printing plate, while it is being held by said second flat surface, upon and in register with a curved mounting plate thereby securing said flexible printing plate to said curved mounting plate, and repeating the above process until said curved mounting plate carries a plurality of printing plates.

13. A registering device for registering and mounting a series of printing plates, a lower surface to contact the back of each printing plate, means exerting a force on the back of the printing plate to hold the printing plate to the lower surface, micrometrical and backlash free means to move the lower surface in all directions and rotations in its plane to register each printing plate, a second surface to contact the plate on its printing surface, means exerting a force on the printing surface to hold the printing plate to the second surface, means to transfer the holding force from the back to the printing surface of the plate, means to move the second surface with the printing plates to a new location where they will be fixed in accurate registered relationship on a mounting plate, and means for registering said second surface with respect to said lower surface.

14. A register device for registering and mounting a series of multi-color printing plates, comprising a support, an up-facing surface carried by said support and arranged to hold a printing plate, micrometric and backlash free adjustment

devices for moving said up-facing surface with respect to said support, a frame, a down-facing surface carried by said frame and arranged to hold the said printing plate, means to move said frame, said down-facing surface and the printing plate held thereto, and means for registering said frame with respect to said support, and means for selectively releasing said printing plate from said surfaces.

15. A process for registering and mounting a series of multi-color printing plates which comprises placing printing plates upon independent first surfaces, applying a holding force to said printing plates upon the first surfaces, adjusting the first surfaces to bring the printing plates in register with a gauge which is lowered upon the printing plates, removing the gauge and having a second surface contact the printing surface of the plates, removing the plate holding force from the first surfaces and applying it to the second surface, moving the second surface with the plates to a third surface, fixing the printing plates on the third surface in register with it and with each other.

16. A printing plate registering and mounting device comprising a frame structure, up-facing surfaces adjustably supported by said frame, means for holding printing plates to said surfaces, no-backlash-means for moving and rotating said surfaces, register means to indicate the correct location of the printing surfaces, a second surface to contact and hold the upper or printing surfaces of the plates, means to move the second surface to a different location to apply adhesives, means to move the second surface to a third surface, and means to accurately locate the register means, the second surface above the first surfaces, the third surface on the support, and the second surface on the third surface.

17. A registering device for registering and mounting a series of multi-color printing plates comprising a flat table-top, an up-facing suction box adjustably supported by said table-top, a registering transparency positionable over said suction box, at least one adjusting screw arranged to move said suction box with respect to said table-top and into register with said transparency, a down-facing suction box pivotally and slidably mounted with respect to said up-facing suction box, exhausting pipes and valves arranged to exhaust said suction boxes, and means for registering said suction boxes with respect to each other.

18. In a device for registering and mounting a printing plate, a suction box having a perforated cover plate constructed and arranged to engage and hold the rear of said printing plate, a second suction box having a perforated cover plate constructed and arranged to engage and hold the face of said same printing plate, and means for controlling the suction in said boxes.

19. A process for registering and mounting a series of multi-color printing plates which comprises placing a printing plate, designed to print a first color, upon a first suction surface, holding said printing plate to said surface by suction, properly positioning the said printing plate with the aid of said suction surface, lowering a second suction surface over said printing plate, securing said printing plate to said second surface by the use of suction, releasing the suction of the first surface, moving said second suction surface and said plate to a location remote from said first suction surface, and fixing said printing plate upon and in register with a third surface, releasing the grip of said second suction surface from said printing plate, and repeating said process for printing plates designed to print one or more additional colors.

20. A process for registering and mounting a series of multi-color printing plates which comprises placing a printing plate upon a first suction surface, holding said printing plate upon said first suction surface, adjusting said first suction surface to bring the printing plate into register with a gauge which is lowered upon the printing plate, removing the gauge and having a second suction holding surface contact the printing surface of the plate, applying a suction holding force to said second suction surface, removing suction from the first suction surface, moving the second suction surface with the plate attached thereto to a third surface, and securing the printing plate to the third surface in register therewith.

21. A device for registering and mounting on a cylinder, a flexible printing plate having a design carrying side and a non-design carrying side, said device comprising, means remote from said cylinder for registering said printing plate, a gripping device arranged to grip in register the design carrying side of said printing plate, means for applying adhesive to the non-design carrying side of said plate, means of which one part is secured to said cylinder and of which the other part is secured to said gripping device for holding said printing plate with said non-design carrying side in register with said cylinder, and a handle connected to one of said last named parts and designed when moved to roll said printing plate from said gripping device to and in register with said cylinder.

22. A device for registering and mounting a series of printing plates, comprising, a frame, a cylinder, means for turnably supporting said cylinder on said frame, an up-facing suction box supported by said frame, said up-facing suction box having a perforated cover for gripping the lower surface of said printing plates, a down-facing suction box supported by said frame, said down-facing suction box having a perforated cover for gripping the upper surface of said printing plates, means for exhausting air from both of said suction boxes, an arm carried by said frame and movably supporting said down-facing suction box, and an alignment member carried by said frame and engaged by said arm, said alignment member aligning said down-facing suction plate and the printing plate carried thereby with respect to said cylinder.

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