

Nov. 29, 1955

D. D. VANDERCOOK ET AL

2,725,010

MULTI-COLOR PROOF PRESS

Original Filed March 22, 1947

6 Sheets-Sheet 1

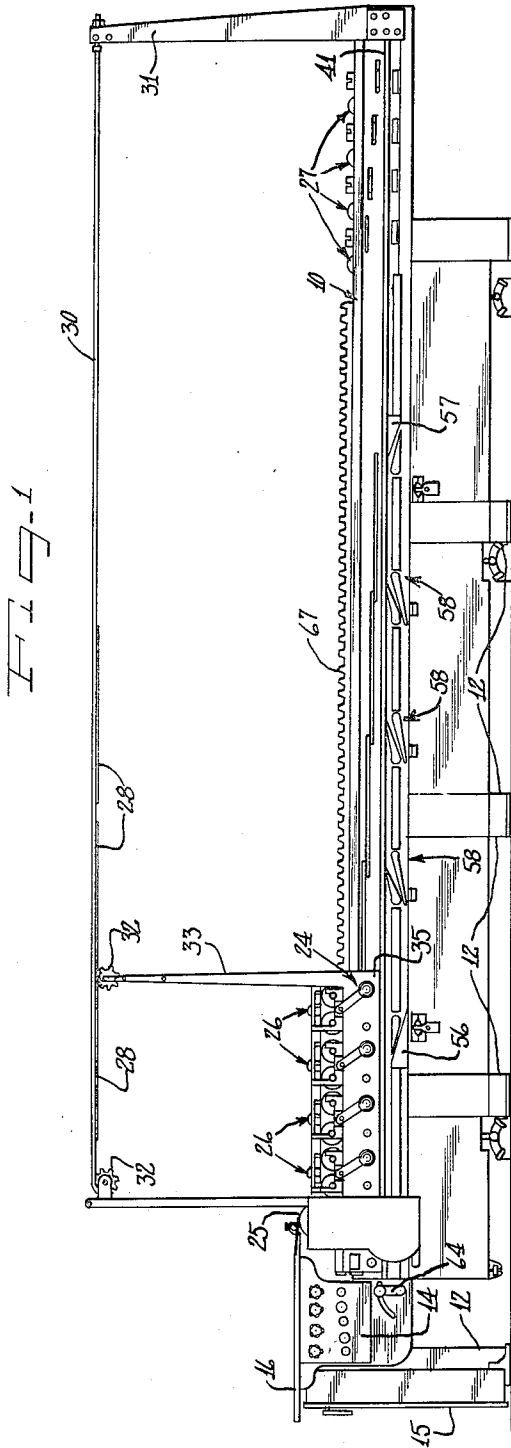
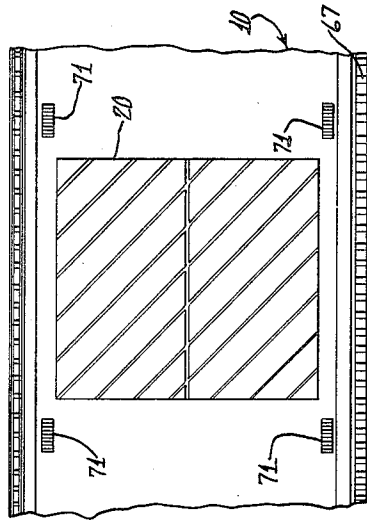


Fig. 1



Inventors
 David D. Vandercook
 Edward O. Vandercook
 Raymond L. Pelland

Attorneys
 Mel. Sherman, Messrs. Cass & Simpson

Nov. 29, 1955

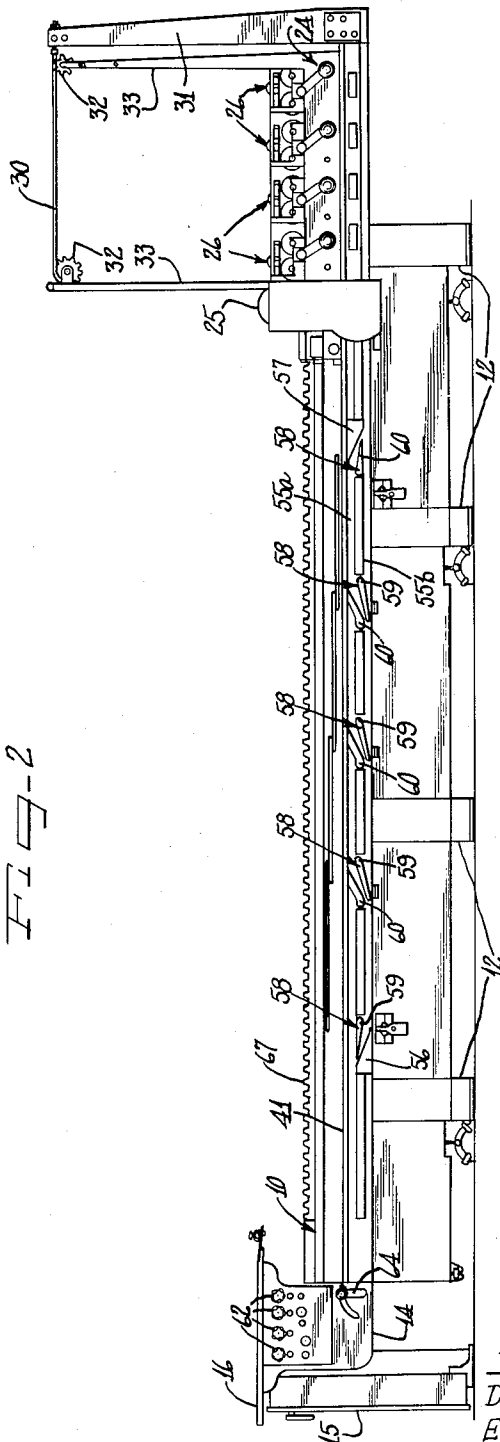
D. D. VANDERCOOK ET AL

2,725,010

MULTI-COLOR PROOF PRESS

Original Filed March 22, 1947

6 Sheets-Sheet 2



Inventors
David D. Vandercook
Edward O. Vandercook
Raymond L. Pelland

Wm. Chapman, Merri, Chas. Simpson Attys

Nov. 29, 1955

D. D. VANDERCOOK ET AL

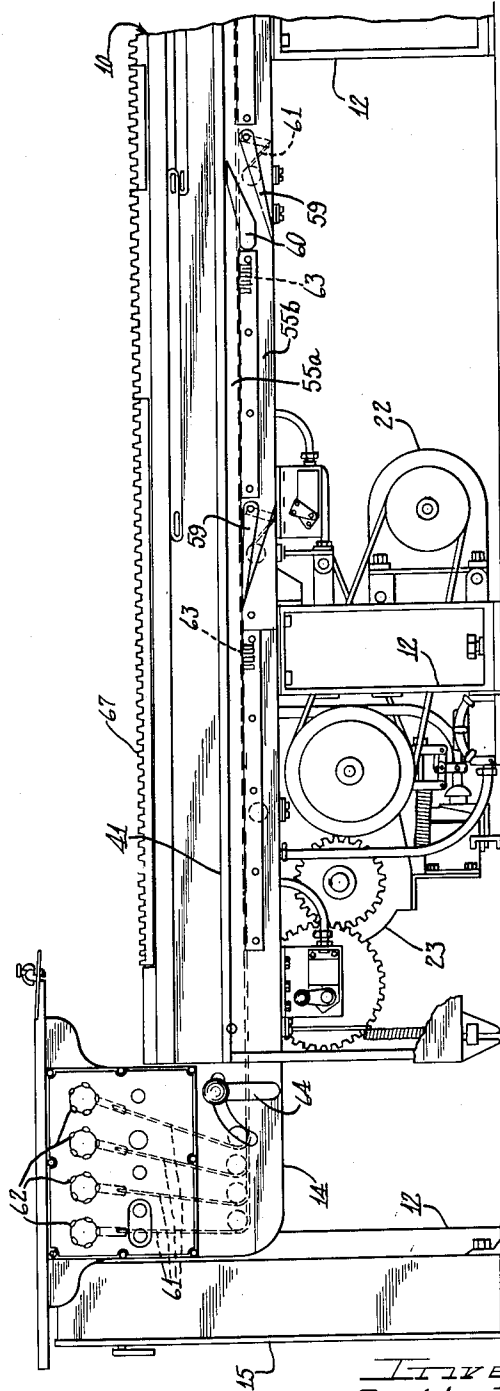
2,725,010

MULTI-COLOR PROOF PRESS

Original Filed March 22, 1947

6 Sheets-Sheet 3

Fig. 3



Inventors
 David D. Vandercook
 Edward O. Vandercook
 Raymond L. Pelland

Hill, Sherman, Merrin, Cross & Hampton Attys

Nov. 29, 1955

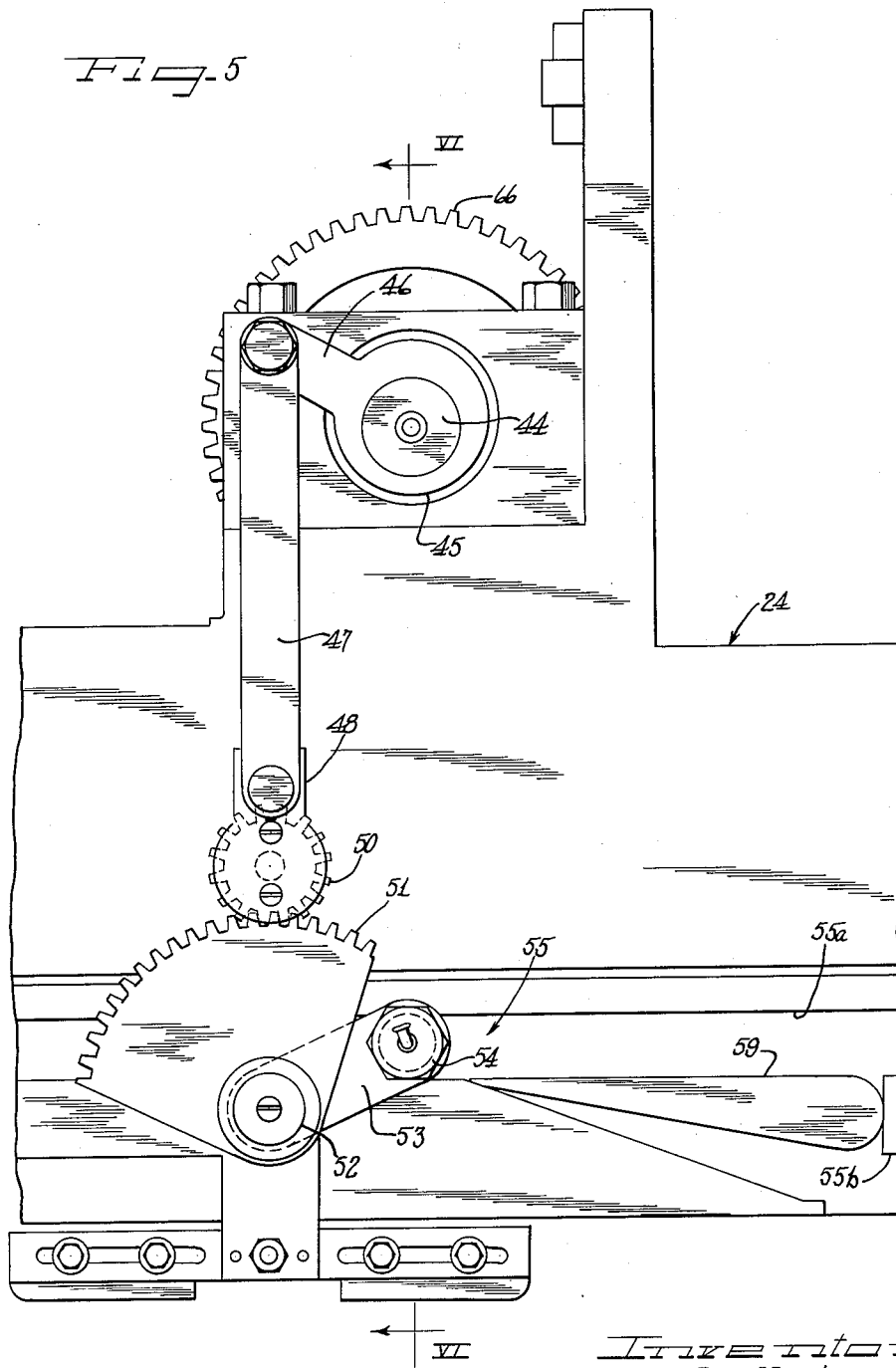
D. D. VANDERCOOK ET AL

2,725,010

MULTI-COLOR PROOF PRESS

Original Filed March 22, 1947

6 Sheets-Sheet 5



Inventors
David D. Vandercook
Edward O. Vandercook
Raymond L. Pelland

Attorneys
McClintock, Sherman, Thayer, Chase & Livingston

Nov. 29, 1955

D. D. VANDERCOOK ET AL

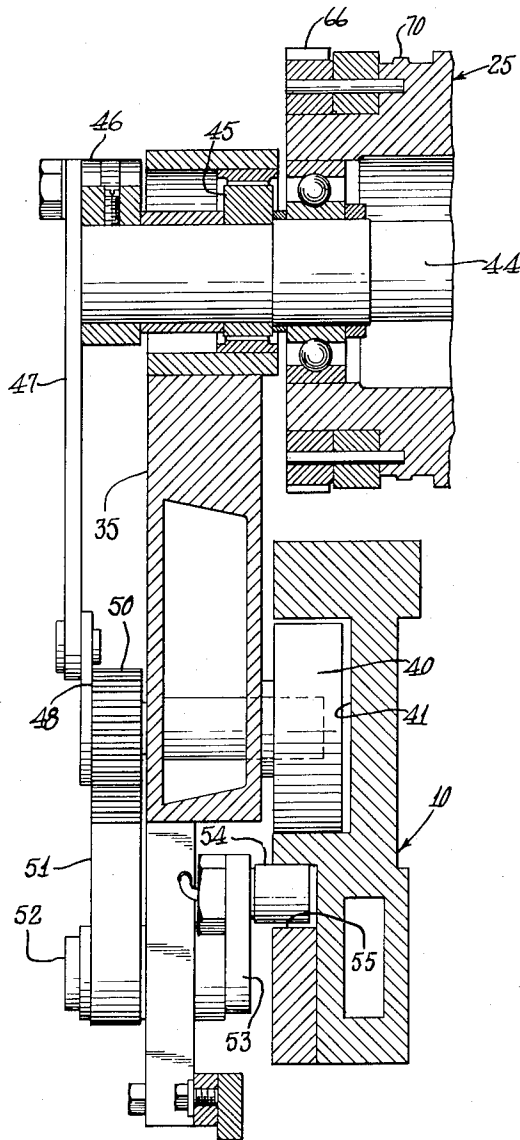
2,725,010

MULTI-COLOR PROOF PRESS

Original Filed March 22, 1947

6 Sheets-Sheet 6

Fig. 6



Inventors
David D. Vandercook
Edward O. Vandercook
Raymond L. Pelland

Attorneys
Mill, Sherman, Morris, Chase & Kingman

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2,725,010

MULTI-COLOR PROOF PRESS

David D. Vandercook, Evanston, Edward O. Vandercook, Kenilworth, and Raymond L. Pelland, Chicago, Ill., assignors to Vandercook & Sons, Inc., Chicago, Ill., a corporation of Illinois

Original application March 22, 1947, Serial No. 736,496, now Patent No. 2,610,581, dated September 16, 1952. Divided and this application May 31, 1952, Serial No. 290,992

10 Claims. (Cl. 101—186)

This invention relates to a printing press, and particularly to a multi-color proof press by which the color composition characteristics of a set of color printing forms may be determined in advance of their application to high speed production presses but under equivalent conditions of operation as exists in such high speed production presses.

This application is a division of our copending application entitled "Multi-Color Proof Press" filed March 22, 1947, U. S. Serial No. 736,496 and issued as Patent No. 2,610,581 on September 16, 1952.

The proper preparation of a set of forms for multi-color printing is one of the most expensive and time-consuming steps of the entire process of producing multi-color printed illustrations. It has been found to be entirely insufficient to secure merely a contact impression from the various forms of a multi-color set in advance of the application of such forms to the high speed production presses, inasmuch as the color composition of an illustration produced by a given set of multi-color forms on a high speed production press will vary substantially and unpredictably from that obtained by superposed contact impressions from the same set of forms. It has therefore been recognized that representative proofs can be obtained in multi-color printing only by taking impressions from the set of multi-color forms under conditions which are substantially equivalent to the printing conditions under which such forms will be used in the high speed production press. Heretofore there has not been available any satisfactory proof press which would permit multi-color proofs to be obtained from a set of forms under conditions which were truly representative of those encountered in the production presses and which would therefore provide an accurate proof both as to the configuration of the particular illustration and the multi-color composition.

Accordingly, it is an object of this invention to provide an improved printing press, and particularly an improved proof press for obtaining multi-color proofs from a set of multi-color forms.

Another object of this invention is to provide an improved multi-color proof press wherein the speed of operation and the conditions under which the proof is obtained from the set of multi-color forms are substantially equivalent to that which exists in the high speed production presses in which such forms are to be utilized, hence permitting a multi-color proof to be obtained which is accurately representative of the color printing characteristics of the particular set of forms.

A further object of this invention is to provide an improved multi-color printing press which will accommodate any desired number of forms of a multi-color set and selectively produce proofs from such forms consisting either of a multiple impression of all such forms on a single sheet, a single impression from any selected one of such forms, or a multiple impression of any desired combination of two or more of such forms.

A particular object of this invention is to provide an

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improved proof printing press wherein the forms of a multi-color set of printing forms are disposed in spaced relationship along a longitudinal bed and a carriage is reciprocally movable over such bed and carries an impression cylinder to which a proof sheet is attached. The inking of the individual forms and the speed of the impression cylinder with respect to such form is accomplished in such a manner as to provide printing conditions equivalent to those of production presses, and mechanism is provided at one end of the bed for loading successive proof sheets upon the impression cylinder and at the other end of the bed for unloading the printed proof sheet from the impression cylinder.

The specific nature of the invention as well as other objects and advantages thereof will become apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of preferred example only, illustrate one specific embodiment of the invention.

On the drawings:

Figure 1 is a side elevational view of a complete machine embodying this invention showing the carriage positioned at the loading end of the bed.

Figure 2 is a view similar to Fig. 1 but showing the carriage positioned at the unloading end of the bed.

Figure 3 is an enlarged scale, side elevational view of the loading end portion of the machine of Fig. 1 with the side plates removed.

Figure 4 is an enlarged scale, top elevational view of the central portion of the machine of Fig. 1 showing the carriage traversing such central portion.

Figure 5 is an enlarged scale side elevational view of a portion of the carriage, illustrating the adjustable mounting of the impression cylinder in the reciprocable carriage.

Figure 6 is a vertical sectional view taken along the plane VI—VI of Fig. 5.

Figure 7 is a partial top elevational view of the bed, showing the frisket chain positioning racks.

As shown on the drawings:

A very general description of a multi-color proof press embodying this invention will be first presented in order that the following detailed description will be rendered more clear with respect to the functions of each of the detail mechanisms in the machine as a whole.

In general, a machine embodying this invention comprises a longitudinal, horizontal bed 10 which is suitably supported on a plurality of spaced uprights 12. At one end of the bed, hereinafter referred to as the loading end and represented as the left hand end of the machine in Figs. 1 and 2, a control box 14 and control panel 15 are provided and feeding platform 16 overlies panel 15 and box 14 and accommodates a stack of sheets to be printed (not shown).

On the top surface of bed 10 there are suitably mounted a plurality of form mounting blocks 20 (Fig. 4) permitting the securing of any desired number of forms 21 of a multi-color set in longitudinally spaced relationship along the bed 10. Drive means forming no part of this invention but including motors 22 and a gear box casing 23, are provided for reciprocating a carriage 24 along the bed 10.

Carriage 24 journals an impression cylinder 25 as well as a plurality of sets of inking roller units 26, there being an inking roller unit 26 corresponding to each of the form mounting mechanisms on the bed 10.

As the carriage 24 moves along the bed forwardly i. e., from left to right as viewed in Figs. 1 and 2, the impression cylinder 25 picks up a sheet of paper (not shown) from the loading platform 16 and such sheet is wrapped around the periphery of impression cylinder 25. The inking roller units 26 selectively engage the forms 25 to apply

the desired color of ink to such forms in advance of the impression cylinder. The impression cylinder 25 is vertically moved in the carriage 24 as the carriage moves along the bed so as to selectively engage one or more of the forms 21 and thus produce either single color or multi-color impressions on the sheet of paper carried thereon.

At the extreme forward end of the bed 10, the carriage 24 comes to rest overlying a plurality of ink applicator roll units 27 (Fig. 1) which selectively engage the inking roller units 26 to apply a predetermined quantity of proper colored ink to each of such units. The printed sheet is released from the impression cylinder 25 at this point, hence the term "unloading" end of the bed.

To prevent the application of any color of ink to any portion of the proof not requiring such color, a plurality of friskets 28 (Figs. 1 and 4) are provided, there being one frisket for each of the forms of the multi-color set. The friskets 28 are supported by a pair of parallel cables 30. The cables 30 are respectively secured at the forward end of the bed to upright support members 31 and at their rearward end are secured to the bed itself. Intermediate portions of the cables 30 are trained over sprockets 32 provided on the top end of uprights 33 on the carriage 24. The cables 30 are also trained over suitable guiding sheaves carried by the carriage 24 so that on the forward movement of the carriage, the friskets 28 are successively laid over their corresponding forms after the inking roller units 26 have passed thereover, but in advance of the impression cylinder 25. On the return movement of the carriage 24, the friskets 28 are picked up from the bed 10 after the impression cylinder 25 has passed thereover but in advance of the inking roller units. Thus the inking roller units 26 may contact their respective forms and apply ink thereto during each direction of movement of the carriage 24. As will be seen, the impression cylinder 25 is permitted to contact selected forms only during the forward stroke of the carriage. Hence only on the forward stroke of the carriage is the proof printing accomplished.

The carriage 24 comprises a frame member of generally rectangular configuration having hollow, longitudinal extending side wall portions 35 and 36 and transverse wall portions 37 and 38 (Fig. 4). The longitudinal side wall frame portions 35 and 36 respectively overlie a substantial portion of the side walls of bed 10 and a plurality of support rollers 40 (Fig. 6) are suitably journaled in the side frame members of carriage 24 to support carriage 24 for free reciprocal movement along bed 10, the rollers 40 engaging in longitudinal recesses 41 provided on opposite sides of the bed 10.

On the top horizontal surface of bed 10 are the plurality of form support blocks 20 (Fig. 4) of conventional configuration which have a plurality of dovetail grooves 42 therein to receive form clamps 43 to permit a plurality of forms to be positioned in longitudinally spaced relationship along the bed 10 and in identical transverse relationship with respect to the bed 10. Generally, four such form support blocks 20 will be provided, inasmuch as most multi-color printing processes employ forms corresponding respectively to the three primary colors and black. It will, of course, be understood that any desired number of form support blocks 20 may be incorporated in a machine embodying this invention merely by appropriate design of the length of the bed 10.

In the rear end of carriage 24, or the left hand end thereof as viewed in Figs. 1 and 2, the impression cylinder 25 is mounted, disposed in overlying, transverse relationship with respect to the top surface of the bed 10. Impression cylinder 25 is suitably journaled on a coaxial shaft 44 (Figs. 5 and 6). The ends of said shaft are respectively journaled in carriage side walls 35 and 36 in eccentric bearings 45. Hence the vertical position of impression cylinder 25 with respect to the bed 10 may be controlled by rotation of shaft 44 in its eccentric bearings 45.

At the front face of carriage 24 as viewed in Fig. 5, a radial arm 46 is suitably secured to shaft 44 which connects such shaft to a positioning control linkage. The positioning control linkage comprises a link 47 which has its ends pivotally secured respectively to radial arm 46 and to a radial arm 48 which is co-rotatable with a pinion 50. Pinion 50 is in turn driven by a sector gear 51 which is suitably journaled on the side wall 35 of the carriage frame on a stud shaft 52. The pivotal movement of sector gear 51 is in turn controlled by a cam follower arm 53 which has a cam roller 54 secured thereto and engaged in a longitudinally extending cam track 55 provided along the side of the bed 10.

Cam track 55 in reality comprises a pair of parallel, vertically spaced grooves or recesses 55a and 55b, respectively which extend the entire length of bed 10. At the rear end of the bed 10, the cam roller 54 is always engaged in the upper groove 55a. An angular surface 56 (Figs. 1, 2 and 3) communicating between grooves 55a and 55b is provided near the rear end of the bed to insure the positioning of cam roller 54 in upper groove 55 at such end. Likewise, an angular surface 57 is provided at the forward end of bed 10 to insure that the cam roller 54 will always be positioned in the lower groove 55b when the carriage 24 is adjacent its extreme forward position on the bed 10.

The vertical spacing of the grooves 55a and 55b is selected to control the vertical movement of impression cylinder 25 with respect to the bed 10 between a printing and a non-printing position. Thus when cam roller 54 is engaged in upper cam groove 55a, the eccentric bearing support for the impression cylinder 25 lowers the impression cylinder sufficiently to engage such cylinder with the forms 21 with proper pressure for a printing operation. When cam roller 54 is engaged in lower cam groove 55b, then the impression cylinder 25 is raised above the bed 10 to a non-printing position.

At spaced intervals along the cam track 55, corresponding to the spacing of the forms 21 on the bed 10, switch mechanisms 58 are provided to permit the cam roller 54 to be selectively switched from one cam groove to the other as the carriage 24 traverses the bed 10 in the forward direction. While any form of switch mechanism might be utilized, I preferably employ a pair of cooperating switch arms 59 and 60 respectively for each of the switch mechanisms 58. The switch arm 59 is the primary switch member and is pivoted to the side wall of bed 10 at its forward end, hence permitting the rear end thereof to be selectively moved about the pivot from a position projecting into the bottom groove 55b to a position projecting into the top groove 55a.

It will be immediately apparent that switch arm 59 is effective to shift the cam roller 54 from one of the cam grooves to the other only during the forward movement of the carriage on the bed 10. On the rearward movement of the carriage, the switch arm 59 is merely deflected out of the path of the cam roller 54. Hence, since the cam roller 54 is always positioned in the bottom cam groove 55b at the beginning of each rearward stroke, it follows that the cam roller 54 always remains in the bottom groove 55b throughout its rearward stroke until it engages the inclined surface 56 near the rear end of the bed 10 whereupon the cam roller 54 is transferred to upper groove 55a. Hence, the impression cylinder 25 is maintained in a non-printing position with respect to the bed 10 throughout its rearward stroke and starts each forward stroke in a printing position with respect to the bed 10.

The secondary switch arm 60 is pivoted at its rear end to the side walls of the bed 10 in laterally offset relation to the cooperating primary switch arm 59 and functions only as a guard rail with respect to the cam roller 54 during the switching movement of such roller. Each arm 60 is pivotally biased by a suitable spring (not shown) to a normal position wherein it projects into

upper cam groove 55a. Hence switch arm 60 can obviously never have any effect upon the cam roller 54 during the rearward movement of the carriage 24 along the bed 10.

It should be noted that the front and rearmost switch units 58 are disposed immediately adjacent to the inclined surfaces 56 and 57, respectively. With such arrangement, it is only necessary to provide a primary switch arm 59 adjacent inclined surface 56 and a secondary switch arm 60 adjacent inclined surface 57.

The pivotal position of each of the primary switch arms 59 is controlled by an individual cable 61, all of which extend rearwardly along the bed 10, trained over suitable guide pulleys, and are secured to manually operable reels 62. To resiliently bias switch arm 59 to one of its extreme pivotal positions, a spring 63 (Fig. 3) is provided which cooperates between each cable 61 and the bed 10. Hence manual turning of the reels 62 in opposite directions will respectively move the switch arm 59 from one to the other of its extreme pivotal positions. In addition a master lever 64 is provided which will simultaneously move all of the cables 61 to move all the switch arms 59 from one position to another.

It is therefore apparent that the vertical position of the impression cylinder may be selectively controlled between a printing and non-printing position with respect to any one of the forms 21 by manipulation of the particular switch arm 59 which lies in advance of that portion of the cam track 55 corresponding to the location of the selected form. Hence, assuming that four forms are mounted on the bed 10, in the traverse of impression cylinder 25 across the bed, the impression cylinder may be selectively engaged with all four forms in succession, or any one of the forms alone, or any combination of less than the entire number of forms. Hence utmost versatility in obtaining either multicolor proofs or individual color proofs is provided.

The impression cylinder 25 rotates only while the carriage 24 is traversing the bed 10. Such rotation of impression cylinder 25 is produced by a gear 66 (Figs. 5 and 6) which is coaxially secured to impression cylinder 25. Gear 66 engages a rack 67 which extends along the entire length of the top surface of bed 10. Therefore the longitudinal position of any point on the surface of impression cylinder 25 with respect to any one of the forms 21 is definitely determined by the rack 67. To increase the accuracy of the locating action of rack 67, those portions of the rack which correspond to the position of the cylinder when engaging the forms 21 are machined to a high degree of accuracy and provide a close fit with the teeth on the cooperating cylinder gear 66. Intermediate portions of the rack 67 are machined to provide greater clearance between the teeth of the rack and the cooperating gear and hence diminish the friction therebetween and the effort required to drive the carriage 24 along the bed 10. This may be conveniently accomplished by lowering the pitch line of the teeth of such sections.

While not shown in detail, it will be understood that the impression cylinder 25 is provided with a conventional paper grasping mechanism so that the loading of successive paper sheets on the cylinder will be accomplished automatically each time that the cylinder moves to the rear end of the bed adjacent the loading platform 16.

In multi-color printing there are certain areas on the original plates which must be masked off by means of a frisket when making proofs.

In a machine embodying this invention a frisket support frame is provided for each one of the form support blocks 20. Such support frames include spaced parallel members 69 (Figure 4) which are supported between the pair of parallel flexible frisket support cables 30 and are provided with suitable means (not shown) for supporting the friskets 28 therebetween. Preferably the frisket support cables 30 take the form of flexible chains which greatly

facilitates the synchronization of the position of the friskets with respect to their corresponding forms.

At the forward end of the bed 10, the support chains 30 are respectively secured to the top of the uprights 31 which are in turn suitably secured to the bed 10. The uprights 33 are formed on the carriage 24 and the sprockets 32 are suitably mounted on the top of uprights 33 and the support chains 30 are trained thereon. From the rearmost sprockets 32, the frisket support chains pass downwardly and are trained around suitable grooves 70 (Fig. 6) provided in the periphery of impression cylinder 25. The rear ends of sprocket support chains 30 are fixedly secured to the rear end of bed 10 in any suitable manner.

From the foregoing description, it will be apparent that as the carriage 24 moves forwardly on bed 10 and impression cylinder 25 rotates on rack 67, the frisket support chains 30 will be progressively trained under the impression cylinder 25 to lie on the top of bed 10. Hence, the friskets 28, which are supported in longitudinally spaced relationship along the support chains 30 at spacings corresponding to the location of their corresponding forms 25 on the bed 10, will be successively overlaid on their proper forms 21. To assure correct longitudinal alignment of the friskets with the forms, a plurality of sets of locating racks 71 (Fig. 7) are provided on the bed 10 to mesh with chains 30 adjacent each of the forms 25.

The operation of the friskets is particularly well illustrated in Fig. 4 wherein the carriage 24 is shown in an intermediate position along the bed 10 wherein the first frisket 28 has been superimposed on a corresponding form 21, the second and third friskets do not show, being in the vertical portion of the travel of the frisket support chains 30 parallel to the rear upright 33, and the fourth frisket 28 is shown in its position vertically superimposed above the carriage 24. Further movement of the carriage 24 toward the right as viewed in Fig. 4 will superimpose the second and third friskets over their corresponding forms and bring the fourth frisket 28 down over the vertical portion of the travel of the frisket support chains 30 and then superimpose such frisket over the fourth form 21.

It should be particularly noticed that on the forward movement of the carriage 24, the friskets are applied to their corresponding forms subsequent to the engagement of the corresponding inking roller units 26 therewith but in advance of the engagement of the impression cylinder 25. On the return movement of the carriage 24 along the bed 10, the friskets are picked up from their superimposed position with respect to the forms 21 in advance of the passage of the inking roll units over such forms but subsequent to the passage of the impression cylinder 25. However, on the return stroke, it will be remembered that the impression cylinder 25 does not engage any of the forms 21. Hence in either direction of movement of the carriage 24 on the bed 10, the friskets are completely removed from the forms when the inking roll units 26 pass thereover and hence the friskets never interfere with the inking operation.

It will be thus apparent that this invention provides an impression cylinder control and frisket applying means cooperating to provide a multi-color proof press which is highly efficient and reliable in operation and yet can be readily manufactured, requiring a minimum of parts.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

We claim as our invention:

1. A multi-impression printing press comprising a longitudinal bed, a carriage reciprocally movable along said bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, means for inking said forms, an impression cylinder, bearing means for journalling said impression cylinder on said carriage, said bearing means being movable on said carriage between positions remote and proximate to said bed, and selectively

operable means for shifting said bearing means to said proximate position at a position of said carriage along said bed where said cylinder overlies a selected one of said forms, thereby engaging said cylinder with each selected form as said carriage traverses the bed.

2. The combination defined in claim 1 wherein said selectively operable means are constructed and arranged to shift said cylinder to said proximate position with respect to said bed only during one direction of movement of said carriage along said bed.

3. A multi-impression printing press comprising a longitudinal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed, a plurality of inking roller units on said carriage, there being an inking roller unit for each form with each unit inking the corresponding form as said carriage traverses said bed, an impression cylinder rotatably mounted on said carriage and adapted to engage said forms during the movement of said carriage along the bed, and means on said cylinder for securing a paper sheet therearound to receive impressions from said forms, a frisket for each of said forms, chain means for suspending said friskets in overlying relation to said bed including chain guides on said carriage, said chain guides being constructed and arranged to guide said chain means to superpose each of said friskets on its corresponding form behind said inking rollers and in advance of said impression cylinder as said carriage moves along said bed.

4. A multi-impression printing press comprising a longitudinal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed, an impression cylinder rotatably mounted on said carriage and adapted to engage said forms successively as said carriage moves along the bed, a frisket for each of said forms, a pair of flexible support cables supporting said friskets in longitudinally spaced relation corresponding to the arrangement of said forms on said bed, means for supporting said cables in overlying relation to said bed, including an elevated support at one end of the bed, and cable guide means on said carriage having the intermediate portions of said support cables trained thereon, said cable guide means being constructed and arranged to successively lay said friskets over their respective forms in advance of said cylinder as said carriage moves toward said one end of the bed and to successively elevate said frisket behind said cylinder above said forms as said carriage moves to the other end of the bed.

5. The combination defined in claim 4 wherein said support cables comprise flexible chains and said cable guide means comprises a pair of sheaves respectively formed on opposite ends of said impression cylinder.

6. A multi-impression printing press comprising a longitudinal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed through a forward stroke and then a return stroke, a plurality of inking roller units on said carriage, for inking said forms as said carriage moves along said bed, an impression cylinder rotatably mounted on said carriage at the rear end of the carriage with respect to said inking rollers, said cylinder being constructed and arranged to engage said forms successively as said carriage moves forwardly along the bed, a frisket for each of said forms, a pair of flexible support cables supporting said friskets in longitudinally spaced relation corresponding to the arrangement of said forms on said bed, means for supporting said cables in overlying relation to said bed, including an elevated support at one end of the bed, and cable guide means on said carriage having the intermediate portions of said support cables trained thereon, said cable guide means being constructed and arranged to successively lay said friskets over their respective forms behind said inking roller units and in advance of said cylin-

der as the carriage moves forwardly on the bed and to successively elevate said frisket behind said cylinder and in advance of said rollers as said carriage moves along the bed on its return stroke.

7. The combination defined in claim 6 wherein said support cables comprise flexible chains and said cable guide means comprises a pair of sheaves respectively formed on opposite ends of said impression cylinder.

8. A multi-impression printing press comprising a longitudinal horizontal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed through a forward and a return stroke, a plurality of inking roller units on said carriage, an impression cylinder rotatably mounted on said carriage moves along the bed, a frisket for each of said forms, a pair of flexible support cables supporting said friskets in longitudinally spaced relation corresponding to the arrangement of said forms on said bed, upright supports respectively located on the forward end of said bed and on said carriage, said cable being secured to said upright support on the bed and trained on said upright support on the carriage, and cable guide means on said carriage having said cable trained thereon rearwardly of said upright support, said cable guide means being constructed and arranged to successively lay said friskets over their respective forms in advance of said cylinder as said carriage moves forwardly on the bed and to successively elevate said friskets above said forms behind said cylinder as said carriage moves along the bed in its return stroke.

9. A multi-impression printing press comprising a longitudinal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed through a forward stroke and a return stroke, horizontal bearing means on said carriage, means for varying the vertical position of said bearing means including a cam follower, an impression cylinder journaled in said bearing means, a longitudinally extending cam track on said bed engageable by said cam follower, said cam track having a plurality of alternative path portions respectively arranged to position said cylinder in either a printing or non-printing position with respect to said bed, there being a set of alternative paths corresponding to the position of each of said forms on said bed, switch members respectively disposed in advance of said alternative path portions, and means for selectively operating said switch members, whereby said cylinder engages any selected form as said carriage traverses the bed.

10. A multi-impression printing press comprising a longitudinal bed, means on said bed for supporting a plurality of forms in longitudinally spaced relation thereon, a carriage reciprocably movable along said bed through a forward and a return stroke, horizontal bearing means on said carriage, means for varying the vertical position of said bearing means including a cam follower, an impression cylinder journaled in said bearing means, a longitudinally extending cam track on said bed engageable by said cam follower, said cam track comprising a pair of parallel portions respectively constructed and arranged to position said cylinder in a printing position or a non-printing position with respect to said bed, means at the forward end of said track directing said cam follower into said non-printing portion of said track, a plurality of switches spaced along said cam track portion and dividing the track into sectors corresponding respectively to the positions of said form on said bed, each of said switches having one position wherein said follower is directed into the following non-printing track portion on forward movement of said carriage and another position wherein said follower is directed into the following printing track portion on the forward movement of the carriage with the follower being maintained in the non-printing track portion on the return movement of the carriage in either position of said switches, and means for

selectively operating said switch members, whereby said cylinder engages any selected forms only as said carriage traverses the bed in the forward direction.

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