Aug. 21, 1951 H. J. WATROUS 2,565,054

AUTOMATIC SHEET REGISTERING DEVICE FOR LITHOGRAPHIC AND PRINTING PRESSES

Filed Oct. 19, 1946 3 Sheets-Sheet 1

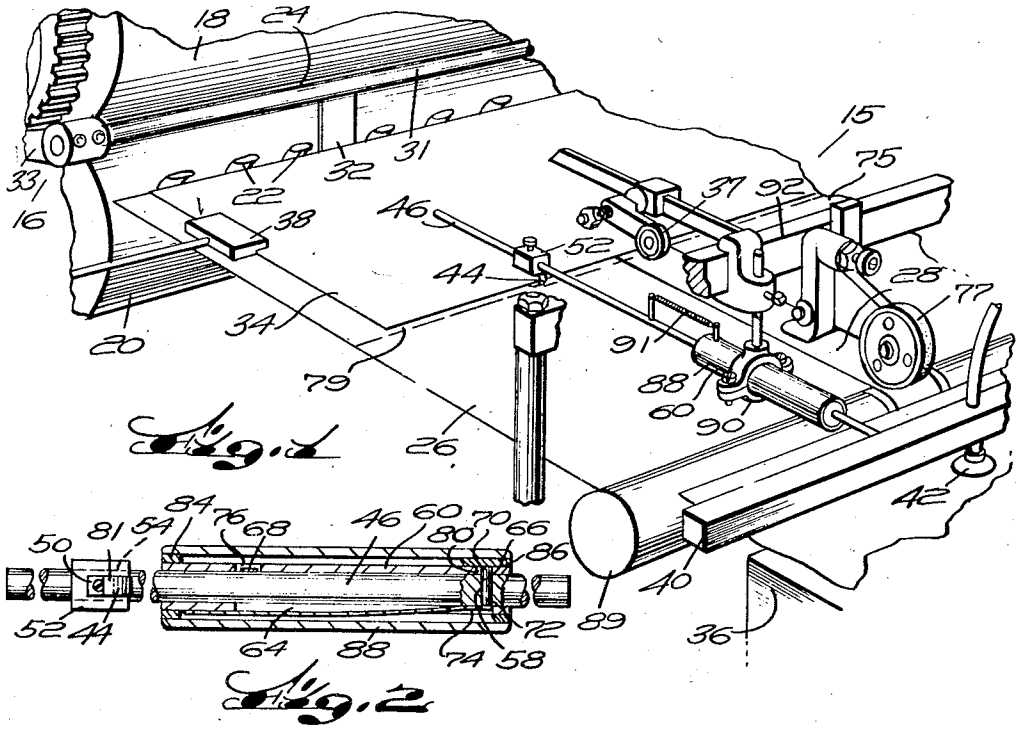


Fig. 1

Fig. 2

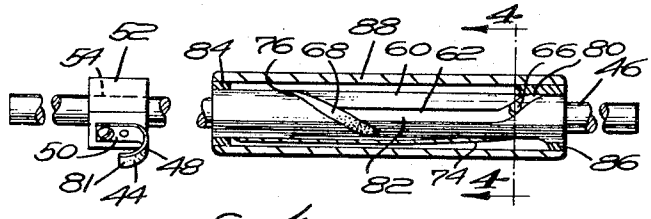


Fig. 3

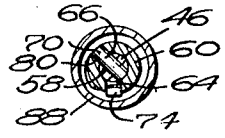


Fig. 4

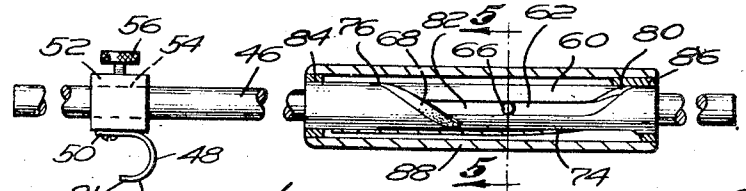


Fig. 5



Fig. 6

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AUTOMATIC SHEET REGISTERING DEVICE FOR LITHOGRAPHIC AND PRINTING PRESSES

Filed Oct. 19, 1946 3 Sheets-Sheet 2

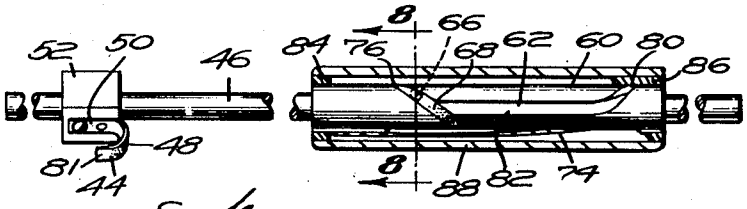


Fig. 7

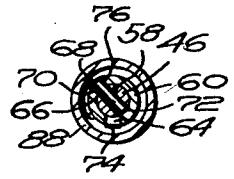


Fig. 8

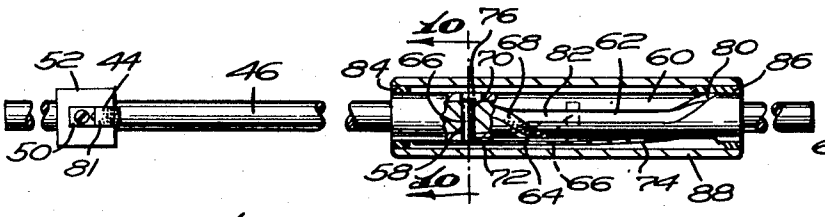


Fig. 9

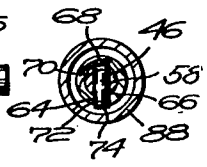


Fig. 10

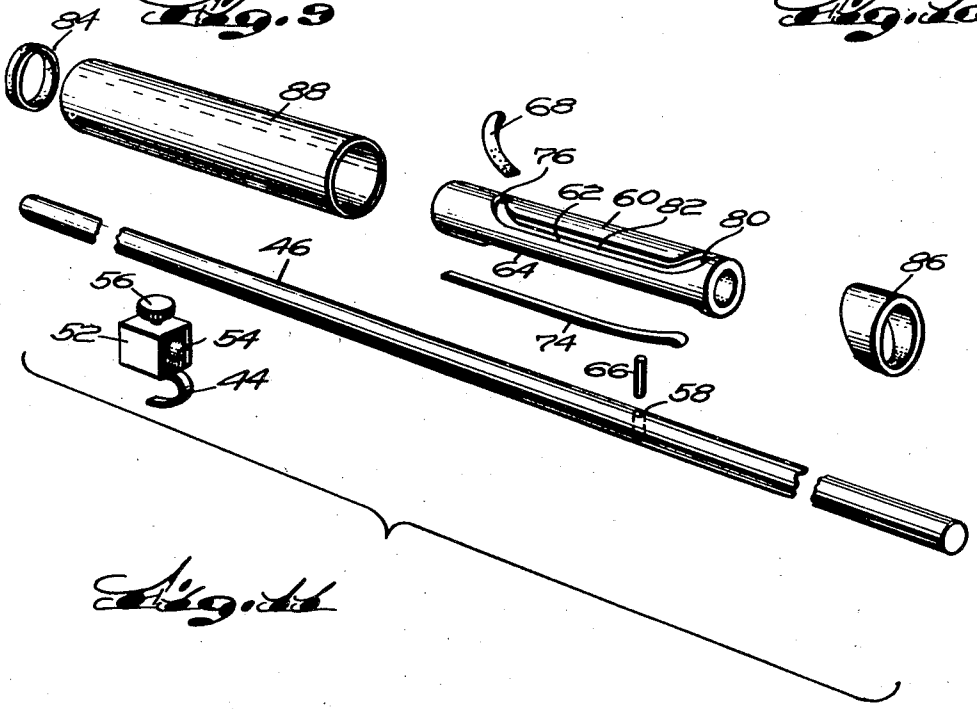


Fig. 11

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AUTOMATIC SHEET REGISTERING DEVICE FOR LITHOGRAPHIC AND PRINTING PRESSES

Filed Oct. 19, 1946

3 Sheets-Sheet 3

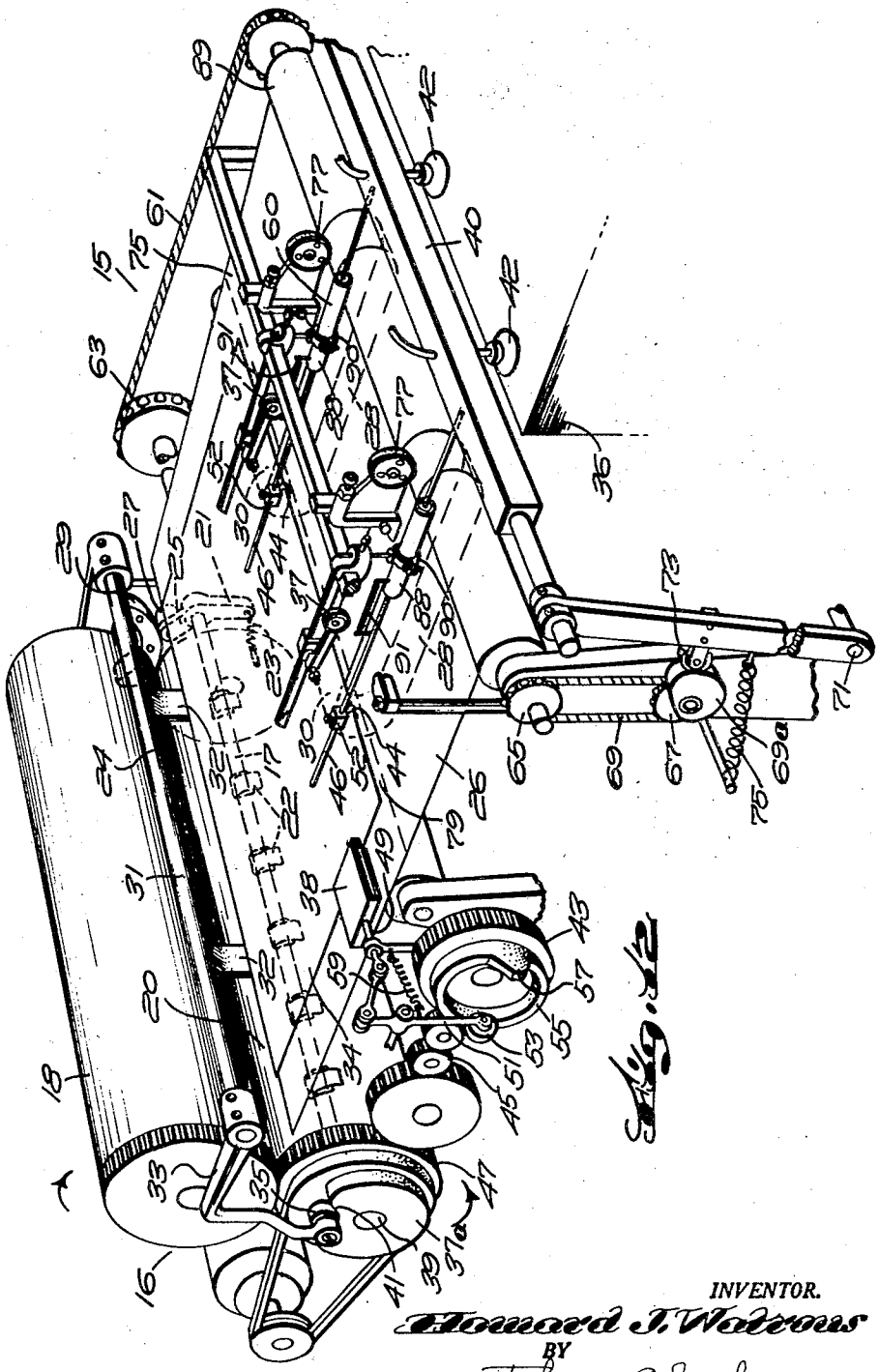


Fig. 12

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UNITED STATES PATENT OFFICE

2,565,054

AUTOMATIC SHEET REGISTERING DEVICE FOR LITHOGRAPHIC AND PRINTING PRESSES

Howard J. Watrous, Cranston, R. I.

Application October 19, 1946, Serial No. 704,468

8 Claims. (Cl. 271—55)

1

My invention relates to improvements in automatic sheet handling or registering devices. While my invention is particularly designed for lithographic and printing presses and I have shown it applied to a lithographic press in the drawings, it is apparent that my sheet handling mechanism may be used in any instance where registration of sheets is desired.

Automatic sheet feeding rotary, lithograph and printing presses of the type commonly in use include a pile of sheets, means preferably comprising vacuum suckers that lift them one at a time and pass them on to conveyor tapes and wheels or rollers that carry the sheets individually up to the front guides of the press. These wheels or rollers not only carry successive individual sheets forwardly, but hold them steadily relative to the front guides while the usual side guide pushes each sheet and registers it laterally. Grippers in the press grasp successive sheets and the front guides tilt out of the way for the sheet to pass through the press. The above is a synopsis of the sheet feeding mechanism of a well known type of lithographic rotary cylinder printing press.

The wheels or rollers have one great disadvantage. They must run just off the back edge of the sheet when the sheet is adjacent the front guides. These wheels are set in this position before the run is started. Paper always varies in length because the best paper cutter can not guarantee absolute accuracy and changing humidity varies the size of each sheet. When sheets shorter than usual come through, the wheels do not get them up to the front guides, or should the momentum carry the sheet, it often bounces out of registration. If the sheets are too long, the wheels rest on the back of the sheet, causing the side guide to buckle or swing the sheet away from the front guides. The only remedy at present is for the operator to continuously check the registration of the sheets and move the wheels accordingly throughout the run, requiring the continuous observation and supervision of the operator. In other types of sheet feeding devices of which I am aware, in place of conveyor tapes, pivoted pusher members have been provided which swing on an arc to push successive sheets against the front guides. These have not worked out satisfactorily in practice as they so bind the sheets against the front guides as to cause them to buckle and in addition often prevent any lateral registration at all.

I have discovered that for correct registration

2

or area of greater length and width than each sheet to be registered, immediately in rear of and adjacent the front guides and that instead of depending on the feeding means such as the conveyor rollers or tapes or pivoted feeding members to effect the longitudinal registration I have provided supplemental pusher means to abut the trailing edge of a sheet when on said registration support or area to gently urge it forwardly to abut the front guides preferably at the same time that the side guide is acting, to provide a simultaneous lateral and longitudinal registration of each sheet on the registration support or area. In order to prevent buckling and to permit the simultaneous lateral registration of each sheet, I preferably construct the pusher means so that it may have a portion such as a flat lower end underlying the trailing edge of the sheet to slide underneath it to prevent the sheet from buckling and an arcuate body portion extending upwardly and rearwardly from said flat lower end adapted to abut the trailing edge of the sheet at the desired height to push it forwardly against said front guides with the sheet being movable laterally in said arcuate portion to permit the lateral registration thereof and to provide for variations in the length of successive sheets.

I have also discovered that better registration is achieved if the trailing edge of the sheet is pushed forwardly substantially in the horizontal plane of the registering support. While others may have realized that a device capable of so pushing a sheet was desirable, they lacked any conception of how to construct such a device. I have discovered, however, that a pusher which will function in a true horizontal plane may be used for the correct longitudinal registration of the sheets if it be tilted or otherwise moved out of the way to permit the intermittent feeding of successive sheets to said registering support by the conveyor tape or other means employed when the pusher is not used for registration. I have also discovered that the sucker bar moves forward substantially in synchronism with the movement of the side guide for lateral registration and that substantially a simultaneous longitudinal and lateral registration may be attained if the push hook be pushed forwardly by the sucker bar and means are provided to tilt the push hook downwardly so that it may push the trailing edge of the sheet forwardly for registration on a portion of the forward stroke of the sucker bar and move it out of the way at other

My invention specifically includes a device comprising a push hook arranged to push a sheet into the front guides, reciprocated by the sucker bar which carries the suction lifting cups to lift a sheet from a pile and place it initially on the conveyor tapes. The forward motion of the sucker bar is synchronized in timed relationship with the movement of the side guide jogging a sheet laterally and for this reason I have mounted my improved push hook so that it may operate during a portion of the forward cycle of the sucker bar to push a sheet against the front guides to assure accurate registration of the sheets against the front guides even while being moved laterally by the side guide, even though the sheets vary in length. I have found, however, that the back motion of the sucker bar was not fast enough to get the pushers out of the way of the next incoming sheet and that in fact the sheets travel so closely together that the pusher member or hook must be out of the way before the sucker bar starts its back motion and for this reason I have mounted my improved push hooks so that they may be reciprocated back and forth by the sucker bar and have provided means for moving the lower end of said push hook downwardly to feed the sheet forwardly from its rear edge against the front guide means only after said roller means has moved said sheet forwardly into said registration area and for moving it away from said surface during other portions of the front and back strokes of said suction bar for the proper feeding of successive sheets to the mechanism during a printing cycle.

An object of my invention, therefore, is to provide a novel type of a sheet feeding device which will continuously cause accurate registration of the sheets against the front guides regardless of minor changes in length of said sheets.

A further object of my invention, due to its continuous accurate registration of the sheets achieved thereby, is to eliminate the necessity for the operator to continuously check the registration and adjust the rollers during the operation of the press.

A further object of my invention is to provide a push guide or hook which is non yielding and concave shaped with a flat lower end adapted to be movable underneath the back of a sheet when in position abutting the front guide means and having an arcuate upwardly and rearwardly extending or concave body portion for pushing the sheet forwardly after it has left said roller means into abutment against the front guide means, namely to provide a push guide or hook shaped with sufficient clearance to handle normal variations in sheet lengths and to permit lateral movement of the sheets for lateral registration.

Further features of my invention relate to improvements in the specific means I employ for turning the push hook into pushing position only during the proper portion of the forward movement portion of the reciprocating cycle of the sucker bar.

Further features of my invention relate to the fact that I have provided a mechanism which may be readily attached to existing machines with the mere addition of a few small parts.

Further objects and advantages of my invention relate to the construction of the parts thereof and permit wide variations in the adaption of my invention to different machines.

These and such other objects of my invention as may hereinafter appear will be best understood

from a description of the accompanying drawings which illustrate an embodiment thereof.

In the drawings,

Fig. 1 is a diagrammatic perspective view of portions of a lithographic single sheet fed printing press and the standard type of feeding device therefor modified in accordance with my invention.

Figs. 2, 3, 5, 7 and 9 are longitudinal sectional views taken through the mechanism I employ for moving the lower end of said push hook downwardly to push the sheet forwardly from its rear edge against said front guide means only as the conveyor means has moved the sheet forwardly adjacent said front guide means and for moving it away from said position on all other portions of the front and back strokes of the sucker bar during the printing cycle, Fig. 2 showing the position of the diametric pin at the beginning of the forward motion stroke of the oscillating rod with the end of the pin pushed by the spring from the return slot into the forward motion slot, Fig. 3 showing the start of the forward motion stroke with the pin passing down the oblique portion of the forward motion slot to rotate the push hook from a horizontal out of the way position to a vertical pushing position, Fig. 5 being a view showing the end of the pin riding in the axial portion of the forward motion slot retaining the push hook in vertical pushing position as the oscillating rod rides forwardly, Fig. 7 being a view showing the pin riding in the oblique out of the way portion of the forward motion slot near the completion of its forward stroke to again lift the push hook out of the way and Fig. 9 being a view of the spring pushing the pin diametrically as it reaches the front end of the forward movement slot, so that its opposite end may be in the return slot to be returned to the starting position in the return slot shown in Fig. 2.

Figs. 4, 6, 8 and 10 are respective cross sectional views showing the position of the sleeve, rod and pin in the respective positions shown in said views.

Fig. 11 is a disassembled diagrammatic perspective or exploded view of the parts of my improved turning mechanism and push hook carried thereby.

Fig. 12 is a diagrammatic perspective view of the entire width of a lithographic single sheet fed printing press and showing graphically standard type of feeding devices therefor modified in accordance with my invention, illustrating diagrammatically the synchronism of drives of the various parts thereof.

In the drawings, wherein like characters of reference generally indicate like parts throughout, I have shown in Figs. 1 and 12 sufficient parts to illustrate the functioning of my invention on a standard type of feeding device **15** for a standard lithographic or printing press **16**, having a printing cylinder **18** and an impression cylinder **20** adapted to contact the printing cylinder. The printing cylinder **18** is suitably driven by any suitable means (not shown) and the impression cylinder **20** is driven by contact therewith. It is apparent, however, that my invention may be used in feeding sheets to any type of press, printing, lithographic, impression or otherwise, having relatively movable pressing means and having means to feed a sheet into position between said pressing means on each actuation thereof or to any machine where registering devices may be employed. When such a press is provided with an impression cylinder, as in lithographic and

printing presses, grippers 22 are usually provided arranged in axial alignment in front of the nip 24 between said cylinders and means are provided on said impression cylinder to pivot the gripping means to the open position shown in Fig. 1 to receive a sheet and to a closed position to grip the edge of said sheet against the periphery of said cylinder and hold it in printing position opposite said printing cylinder 18 on each revolution of said impression cylinder 20, such a suitable means being shown in Patent No. 1,131,836 to Heywood.

Such a means is suggested in Fig. 12 and as shown therein, the individual grippers 22 are mounted on a common rod 17 extending through the lower cylinder and projecting through the end of the cylinder. The end of the rod 17 has a lever mounted thereon comprising an arm 21 urged to its normal position by the spring 23 attached to the press and an arm 25 integral therewith having a roller 27 which abuts a cam 29 rigidly mounted on the press. As the impression cylinder 20 rotates, the roller 27 mounted thereon abuts the stationary cam 29 and causes the grippers 22 to open to receive the end of a sheet 34 between them and the spring 23 causes the grippers to close and bind the sheet against the impression cylinder 20 after the roller 27 has passed the cam 29. The means shown herein, however, are entirely graphic and merely illustrative of one means to actuate the grippers and are simpler than the common means usually employed for this purpose.

In addition to the gripping means 22, such standard type of sheet feeding device includes a conveyor board 26, usually an aluminum plate and a constantly moving conveyor means in the embodiment shown, comprising the tapes 28 (it being obvious that only half a machine is shown in Fig. 1) having inner ends 30 horizontally aligned at a spaced distance with the open position of said gripping means 22. In said machines front guide means or plates 32 are provided to limit the forward movement of the individual sheets 34 and a pile 36 of sheets 34 is provided at the outer end of said conveyor tapes 28. To insure that the individual sheets 34 will be led along said conveyor tapes 28, a plurality of roller means 77 and 37 are provided, one roller means 77 immediately above the rear end of the forward run of the continuously moving tapes 28 and the other roller means 37 substantially at the front end of the forward run of the continuously moving tapes 28, the last mentioned roller means 37 being spaced a slightly greater distance than the length of the sheets 34 to be fed from said front guide means 32. Said roller means 77 and 37, therefore, abut the surface of the sheet 34 to urge it against said conveyor means 28 to provide a nip for successively feeding the individual sheets 34 forwardly on said conveyor tapes 28 towards said gripping means 22 to adjacent the front guide means 32.

Means are provided to move said front guide means 32 from the position shown in Figs. 1 and 12, limiting forward movement of an individual sheet 34 when the gripping means are open and to a position away from said sheet to permit closing of said gripping means 32 to carry the sheet 34 to printing position between said cylinders 18 and 20 or other pressing means employed. While any suitable type of means may be provided for this purpose, a suitable type of means is shown in Pat. No. 1,131,836 aforesaid and another type is shown in Fig. 12. As diagrammatically illustrated in the drawings, the front guides 32 depend from the horizontal rod 31 extending in rear of the printing cylinder, said rod 31 being pivotally mounted on the frame. A bell crank lever 33 extends first forwardly and then downwardly from one end of said rod 31 and has a roller 35 on its cam end normally bearing against a cam 37a rigidly mounted on the drive shaft 39 of the impression cylinder having the extended notch 41 therein. It is thus obvious that with this construction, as the roller rides on the edge of the cam 37a it descends into said notch 41 once during each revolution for an extended period of time to permit the front guides 32 to be urged forwardly in a vertical position at the front end of the registration area or support later to be described and that when the roller 35 rides out of the notch 41, the front guides 32 will be tilted forwardly so that the individual sheets 34 may be fed by the grippers 22 between the printing and impression cylinders 18 and 20. This illustration, however, is also graphic and is purely for the purpose of illustrating a means to actuate the front guides to move them out of the way when not needed for registration, many standard types of means for this purpose being well known in the art.

In order to correctly align said sheet 34 laterally a side guide means 38 is provided and means are provided to move said side guide means 38 inwardly a predetermined adjusting amount to align the sheet laterally when in laterally movable position between said front guide means and roller conveyor means. While various well known types of means are provided in the art to actuate the side guide 38 laterally, for purposes of illustration of a suitable means, I have illustrated graphically in Fig. 12 a means which may be employed for this purpose. The gear 43 is driven by a train of gearing 45 from a gear 47 on the impression cylinder, a rod 49 laterally slidable on a supporting bracket is attached to the side guide 38, and a lever 51 is pivotally mounted on the machine. Said lever 51 has a roller 53 pivotally mounted horizontally on the lower end thereof and an upper end attached by a suitable pivotable link to said rod 49. A cam having a circular outer edge surface 55 is provided on the outer face of the gear 43 and is provided with the outwardly projecting raised portion 57. As the spring 59 normally urges said roller against the flat circular cam surface 55, it is obvious that the side guide 38 will be pushed laterally inwardly by the raised portion 57 and will be immediately pulled outwardly by the spring 59 on all other portion of revolution of the gear 43. The above means is merely given graphically for purposes of illustrating a means although other suitable types of means for actuating the side guides are well known in the art.

Said machines are also provided with a sucker bar 40 carrying the suction cup means 42 and means to actuate it to lift a sheet 34 from a pile 36 and carry it forward into position between the conveyor tapes 28 and roller 77. Any suitable type of means may be provided to actuate the sucker bar 40. In the embodiment shown, the conveyor tapes 28 are driven by the roll 89 which in turn is driven by the chain 61 driving a sprocket thereon driven by a sprocket 63 on the impression cylinder 20. I provide a sprocket 65 on the opposite end of the roll 89 which drives a sprocket 67 through the medium of the chain 69. A timing cam 69a is eccentrically mounted on the sprocket 67 to rotate therewith. The sucker bar

40 is pivotally mounted on the press as at 71 and has a roller 73 projecting forwardly therefrom normally urged against said eccentric cam 69a by the spring 75. Thus, as the roll 89 rotates, the sucker bar 40 is reciprocated forwardly and rearwardly by the eccentric cam 69a abutting the roll 73 thereon. In the embodiment shown, the parts are so constructed that the sucker bar 40 moves forwardly at the same time that the side guide 32 is urged inwardly. The means illustrated are merely graphic, the actual drive means usually employed being more complicated. So much of the printing press and sheet feeding device hereto described is standard practice in a rotary lithographic press.

As stated, the wheels or rollers 37 have one great disadvantage. The wheels 37 must run just off the back edge of the sheet 34 when the sheet 34 is adjacent the front guides 32. The wheels or rollers 37 are set in this position before the run is started. Paper varies in length, because the best paper cutter can not guarantee absolute accuracy, and change in humidity varies the size of the sheets. When shorter sheets come through, the rollers do not get them up to the front guides, or if the momentum carries the sheet forward it bounces out of control. When the sheets 34 come through too long, the rollers 37 rest on the back of the sheet, causing the side guide 38 to buckle or swing the sheet 34 away from the front guides 32. The only remedy at present is for the operator to continuously check the registration of the sheet and to adjust the longitudinal position of the rollers 37 accordingly throughout the run.

As stated hitherto, instead of depending on the longitudinal adjustment of the rollers 37 to effect the longitudinal registration of the sheets 34 against the front guides 32, I preferably move the rollers 37 backwardly to provide a registration support or area 79 between said rollers 37 and front guides 32, in the embodiment shown comprising an area on the feed table or conveyor board 26 and on the front ends of the conveyor tapes 28 in front of said rollers 37 or on said conveyor tapes themselves if extended to adjacent the front guides as on some types of presses and I have provided supplemental means such as pushers 44 actuated by the press preferably in synchronism with the actuation of the side guide 38 to correctly register a sheet 34 longitudinally and laterally on this registration support or area 79.

In most mechanisms of this type, the sucker bar 40 moves forward at the same time that the side guide 38 jogs the sheet 34 laterally and I, therefore, have provided a device actuated by the sucker bar 40, comprising push hooks 44 to push the successive sheets 34 into the front guides 32 on the forward motion of the sucker bar 40, said device being thus reciprocated by the sucker bar 40 to assure accurate registration of the sheets 34 against the front guides 32 even though the sheets 34 vary in length. The back motion of the sucker bar 40 is not fast enough to get the pushers out of the way of the incoming sheets and in fact the sheets 34 travel so close together that the pushers 44 must be out of the way before the sucker bar 40 starts its back motion. For this purpose, I have provided a pusher 44 carried by a rod 46 actuated by the sucker bar 40 to reciprocate back and forth therewith, and means for moving said pusher 44 vertically into position to push the sheet forwardly from its rear edge against said front guide means 32 only after said roller means 37 has moved said sheet forwardly

to said registration area 79 and to move it horizontally away from said position on all other portions of the front and back strokes of the sucker bar 40 during a printing cycle. As the sucker bar rises and falls in addition, the rod 46 is not rigidly attached to the sucker bar, but is pushed forwardly thereby and is held against the sucker bar and pulled rearwardly by the spring 91, having one end attached to said rod and its other end attached to its cover 88, which is rigidly mounted on the press, as explained.

While any suitable type of a pusher 44 may be provided, I preferably provide a push hook 44 of flat stock, having a flat lower end 81 adapted to get underneath the trailing edge of a sheet. To compensate for varying lengths of the sheets, each pusher hook is shaped with an arcuate upwardly and rearwardly extending or concave portion 48 so that sheets of various lengths do not bind between the pushers and front guide means and to permit lateral registration thereof. The rod means 46 are suitably attached to said hooks 44 in any suitable manner, such as by having the upper ends 50 thereof suitably secured to an adjustable bearing 52, having a hole 54 for receiving said rod 46 and an adjustable thumb screw 56 for adjusting the position of said bearing on said rod 46.

While any suitable type of means 60 may be provided for turning the rod 46 and its attached hook 44 to a vertical position to push it forwardly underneath a sheet 34 during the desired portion of the forward motion of the sucker bar 40 and to return it to a position out of the way on all other portions of the front and back strokes of the sucker bar during a printing cycle, so as to permit the feeding of successive sheets 34 on the conveyor tapes 28 without interference by said hooks, in my preferred embodiment said means is preferably constructed as follows: For this purpose the reciprocating rod 46 is provided with a diametric hole 58 and I provide a rigidly mounted sleeve 60 containing said reciprocating rod 46, having a pin receiving forward motion slot 62 and a pin receiving return slot 64 with the ends of said slots being in diametric alignment. I provide a pin 66 the length of the diameter of said rod 46 and the thickness of the wall of said sleeve 60 reciprocatable within said hole 58 and spring means 68 at the front end of the forward motion slot 62 to abut one end 70, the top end as shown, of said pin 66 to urge it from a position within the front end of said forward motion slot 62 to a position with its opposite end, as shown its lower end 72, in the front end of the return slot 64 and spring means 74 at the rear end of the return slot 64 to abut said opposite end 72 of said pin 66 to urge it from its position in said return slot to a position with its said first end 70, its upper end as shown, in the rear end of said forward motion slot 62, at least one of said slots, in the embodiment shown, the forward motion slot 62, having portions bending laterally circumferentially of the sleeve 60, and in the embodiment shown also returning into axial alignment with its point of bending, to impart a turning and returning movement to said rod as it reciprocates in said sleeve 60.

In the preferred embodiment shown, the forward motion pin receiving slot 62 has a front portion 76 and a rear portion 80 extending obliquely a substantial distance through 90° of said sleeve in the same direction of said sleeve and near the front and rear ends of said slot and a center portion 82 continuous with the center ends

of said oblique end portions 76 and 80 extending axially of said sleeve, to provide said turning and returning movement to move the hook 44 from a horizontal position at the beginning of the forward motion stroke to the vertical position shown, holding the vertical position as the hook 44 pushes the sheet 34 forward, and return it to a horizontal position at the completion of the forward motion stroke, with the return slot 64 being straight to retain the hook 44 in a horizontal position out of the way of the incoming supplemental sheet 34 during the entire return stroke.

As stated, Fig. 2 shows the position the parts assume at the start of the forward motion stroke.

Figs. 3 and 4 show the position the parts assume as the pin travels down the front oblique portion of the forward motion stroke.

Figs. 5 and 6 show the position the parts assume as the pin travels through the center portion 82 of the forward motion slot, holding the hook 44 in a vertical position for advancing the sheet 34.

Figs. 7 and 8 show the position the parts assume as the pin rides up the front portion 76 of the forward motion slot 62 to return the hook 44 to a horizontal position.

Figs. 9 and 10 show the position the parts assume with the spring 68 pushing the upper end 70 of the pin 66 diametrically downwardly through the hole 58 so that its lower end 72 may ride in said return slot 64 during the return stroke, at the completion of which, as shown in Fig. 2, the spring 74 abuts said opposite end 72 of said pin 66 to push it diametrically through said hole 58 until said first end 70 is again in said forward motion slot 62 for the completion of another cycle of the sucker bar reciprocation or sheet feeding movement.

In the embodiment shown, the sleeve 60 is suitably fixedly mounted in any suitable manner on the frame of the printing machine and for this purpose preferably has the front circular spacer 84 and the rear circular spacer 86 overlying the ends of the sleeve 60, with a cylindrical cover 88 suitably mounted thereover, and a suitable clamp 90 suitably preferably adjustably mounted on any fixed portion such as the cross bar 92 of the press, rigidly supports the sleeve 60 on the press. If desired, however, so far as the novel turning features of my improved turning mechanism are concerned, the rod 46 may be fixedly mounted and the sleeve 60 movable relative thereto.

While I preferably reciprocate the pushers 44 in a horizontal plane substantially that of the registering support 79 through the medium of the sucker bar 40, it is apparent that they may be so reciprocated by any other portion of the press or mechanism employed, preferably in synchronism with the actuation of the side guide 38. While I preferably employ the turning means 60 shown, it is apparent that any suitable type of turning means may be employed to raise the hooks 44 from a vertical position to a horizontal position or otherwise out of the way of the tapes 28 or other means employed for feeding successive sheets 34 to the registering support 79 and that if desired my improved or other turning means 60 may be employed even if they are actuated by other parts of the mechanism such as the mechanism employed for moving the side guide 38 inwardly.

It is apparent that I have provided a novel type of means for positively feeding sheets of varying length into positive abutment against the front guide means 32 of a press during a desired portion of the printing cycle and moving said means out of the way for the feeding of additional successive sheets during the remainder of the printing cycle and a novel type of mechanism for this purpose with the advantages described above.

It is understood that my invention is not limited to the specific embodiment shown and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim is:

1. In a sheet handling mechanism, a registering support of greater length and width than each sheet to be registered, means to remove successive sheets from said support and feed them in correct registration to other means, front registering guides movable from a position adjacent the front edge of said support for the registration of sheets, away from said support for the functioning of said sheet feeding means, means for feeding successive sheets longitudinally to said registering support including a feed table, constantly moving conveyor means, a pile of sheets stacked at the rear end of said conveyor means, roller means abutting the surface of said conveyor means to feed individual sheets forwardly on said conveyor means, spaced a distance greater than the length of the sheets to be fed from said front guide means to provide a registering support on said feed table and conveyor means, and a sucker bar carrying cup means to lift a sheet from the pile and carry it forwardly into position between the conveyor means and the roller means, side guide means, means to move said side guide means laterally to align a sheet laterally when in laterally movable position on said support between said front guide means and roller means substantially simultaneously with the forward movement of said sucker bar, push hook means of flat stock having a flat lower end adapted to be movable in a horizontal plane underneath the back of a sheet and an arcuate upwardly and rearwardly extending body portion to push said sheet forwardly on said registering support against said front guide means while permitting the lateral registration thereof, rod means attached to said push hook means urged forwardly and backwardly in a horizontal plane by said sucker bar having a diametric hole therein, a sleeve fixedly mounted on said mechanism to surround and support said rod, having a forward motion pin receiving slot having front and rear portions extending obliquely a substantial distance through 90° of said sleeve in the same direction near the rear and front ends thereof and a centre portion continuous with the central ends of said oblique end portions extending axially of said sleeve and a pin receiving return slot having front and rear ends diametrically opposite the front and rear ends of said forward motion slot extending axially of said sleeve, a pin the length of the diameter of said rod plus the thickness of the sleeve wall, reciprocally mounted in said diametric hole in said rod, spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said first end in the rear end of said forward motion slot for tilt-

ing said push hook means downwardly on the forward stroke of said rod means to abut the trailing edge of the sheet to feed it forwardly against said front guide means for the longitudinal registration thereof on said registering support and for tilting it away from the surface of said support to permit the feeding of successive sheets to said support by said sucker bar and conveyor and roller means.

2. In a sheet handling mechanism, a registering support of greater length and width than each sheet to be registered, means to remove successive sheets from said support and feed them in correct registration to other means, front registering guides movable from a position adjacent the front edge of said support for the registration of sheets, away from said support for the functioning of said sheet feeding means, means for feeding successive sheets longitudinally to said registering support including constantly moving conveyor means, pusher means adapted to be movable in a horizontal plane to push said sheets forwardly on said registering support against said front guide means and rod means attached to said pusher means urged forwardly and backwardly in a horizontal plane having a diametric hole therein, a sleeve fixedly mounted on said mechanism to surround and support said rod, having a forward motion pin receiving slot having front and rear portions extending obliquely a substantial distance through 90° of said sleeve in the same direction near the rear and front ends thereof and a centre portion continuous with the central ends of said oblique end portions extending axially of said sleeve and a pin receiving return slot having front and rear ends diametrically opposite the front and rear ends of said forward motion slot extending axially of said sleeve, a pin the length of the diameter of said rod plus the thickness of the sleeve wall, reciprocally mounted in said diametric hole in said rod, spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said first end in the rear end of said forward motion slot for tilting said pusher downwardly on the forward stroke of said rod to abut the trailing edge of a sheet to feed it forwardly against said front guide means for the longitudinal registration thereof on said registering support and for tilting it away from the surface of said support to permit the feeding of successive sheets to said support by said conveyor means.

3. Means for converting reciprocating motion into turning motion comprising a reciprocating rod having a diametric hole therein, a sleeve fixedly mounted to surround and support said rod, having a forward motion pin receiving slot having front and rear portions extending obliquely a substantial distance through 90° of said sleeve in the same direction of said sleeve near the rear and front ends thereof and a centre portion continuous with the central ends of said oblique end portions extending axially of said sleeve and a pin receiving return slot having front and rear ends diametrically opposite the front and rear ends of said forward motion slot extending axially of said sleeve, a pin the length of the diameter of said rod plus the thickness of the sleeve wall reciprocally mounted in said diametric hole in said rod, spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said front end in the rear end of said forward motion slot.

4. Means for converting reciprocating motion into turning motion comprising a reciprocating rod having a diametric hole therein, a rigidly mounted sleeve containing said reciprocating rod having a pin receiving forward motion slot and a pin receiving return slot with the ends of said slots being in diametric alignment, a pin the length of the diameter of said rod plus the thickness of said sleeve wall reciprocatable within said hole and spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said front end in the rear end of said forward motion slot, at least one of said slots having portions bending laterally circumferentially of the sleeve and returning into axial alignment with its point of bending to impart a turning and returning movement to said rod as it reciprocates in said sleeve.

5. Means for converting reciprocating motion into turning motion comprising a reciprocating rod having a diametric hole therein, a rigidly mounted sleeve containing said reciprocating rod having a pin receiving forward motion slot and a pin receiving return slot with the ends of said slots being in diametric alignment, a pin the length of the diameter of said rod plus the thickness of said sleeve wall reciprocatable within said hole and spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said front end in the rear end of said forward motion slot, at least one of said slots having portions bending laterally circumferentially of the sleeve to impart a turning and returning movement to said rod as it reciprocates in said sleeve.

6. Means for converting reciprocating motion into turning motion comprising a rod member having a diametric hole therein, a sleeve member to surround and support said rod member, having a forward motion pin receiving slot having front and rear portions extending obliquely a substantial distance through 90° of said sleeve member in the same direction near the rear and front ends thereof and a centre portion continuous with the central ends of said oblique end portions extending axially of said sleeve and a pin receiving return slot having front and rear ends diametrically opposite the front and rear ends of said forward motion slot extending axially of said sleeve, a pin the length of the diameter of said rod member plus the thickness of said sleeve member wall reciprocally mounted

in said diametric hole in said rod member, spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said front end in the rear end of said forward motion slot, one of said rod and sleeve members being rigidly mounted and the other of said rod and sleeve members being reciprocal relative thereto.

7. Means for converting reciprocating motion into turning motion comprising a rod member having a diametric hole therein, a sleeve member containing said rod member having a pin receiving forward motion slot and a pin receiving return slot with the ends of said slots being in diametric alignment, a pin the length of the diameter of said rod member plus the thickness of said sleeve member wall reciprocatable within said hole and spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said front end in the rear end of said forward motion slot, at least one of said slots having portions bending laterally circumferentially of the sleeve member and returning into axial alignment with its point of bending to impart a relative turning and returning movement to said rod as it reciprocates in said sleeve, one of said rod and sleeve members being rigidly mounted and the other of said rod and sleeve members being reciprocal relative thereto.

8. Means for converting reciprocating motion into turning motion comprising a rod member having a diametric hole therein, a sleeve member containing said rod member having a pin receiving forward motion slot and a pin receiving return slot with the ends of said slots being in diametric alignment, a pin the length of the diameter of said rod member plus the thickness of said sleeve member wall reciprocatable within said hole and spring means at the front end of the forward motion slot to abut an end of the pin to urge it from a position within the front end of said forward motion slot to a position with its opposite end in the front end of the return slot and spring means at the rear end of the return slot to abut said opposite end of said pin to urge it from its position in said return slot to a position with its said first end in the rear end of said forward motion slot, at least one of said slots having portions bending laterally circumferentially of the sleeve to impart a relative turning and returning movement to said rod as it reciprocates in said sleeve, one of said rod and sleeve members being rigidly mounted and the other of said rod and sleeve members being reciprocal relative thereto.

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