

Oct. 9, 1934.

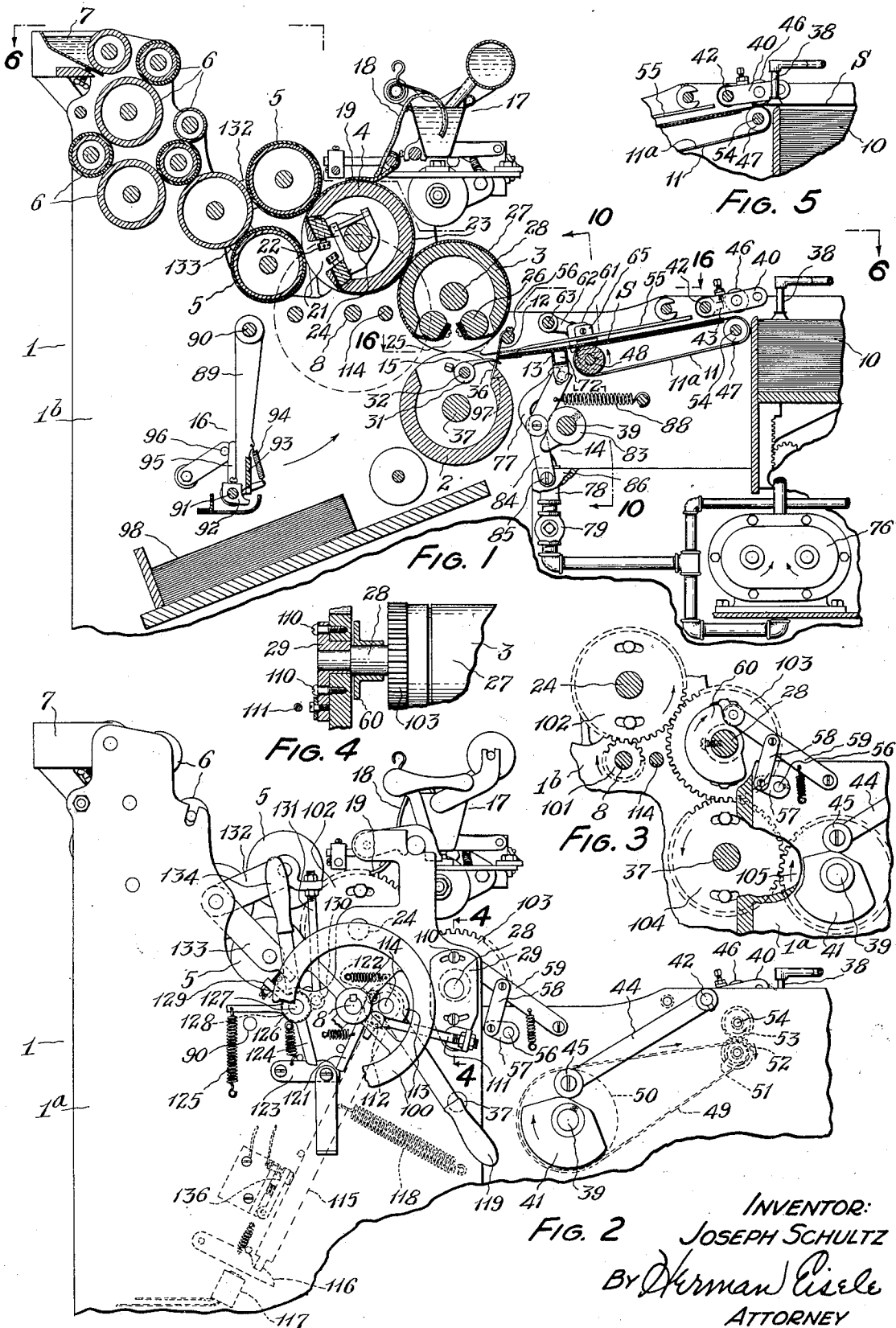
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1,976,582

METHOD OF AND MECHANISM FOR FEEDING SHEETS IN LITHOGRAPHIC PRESSES

Filed July 28, 1932

5 Sheets-Sheet 1



Oct. 9, 1934.

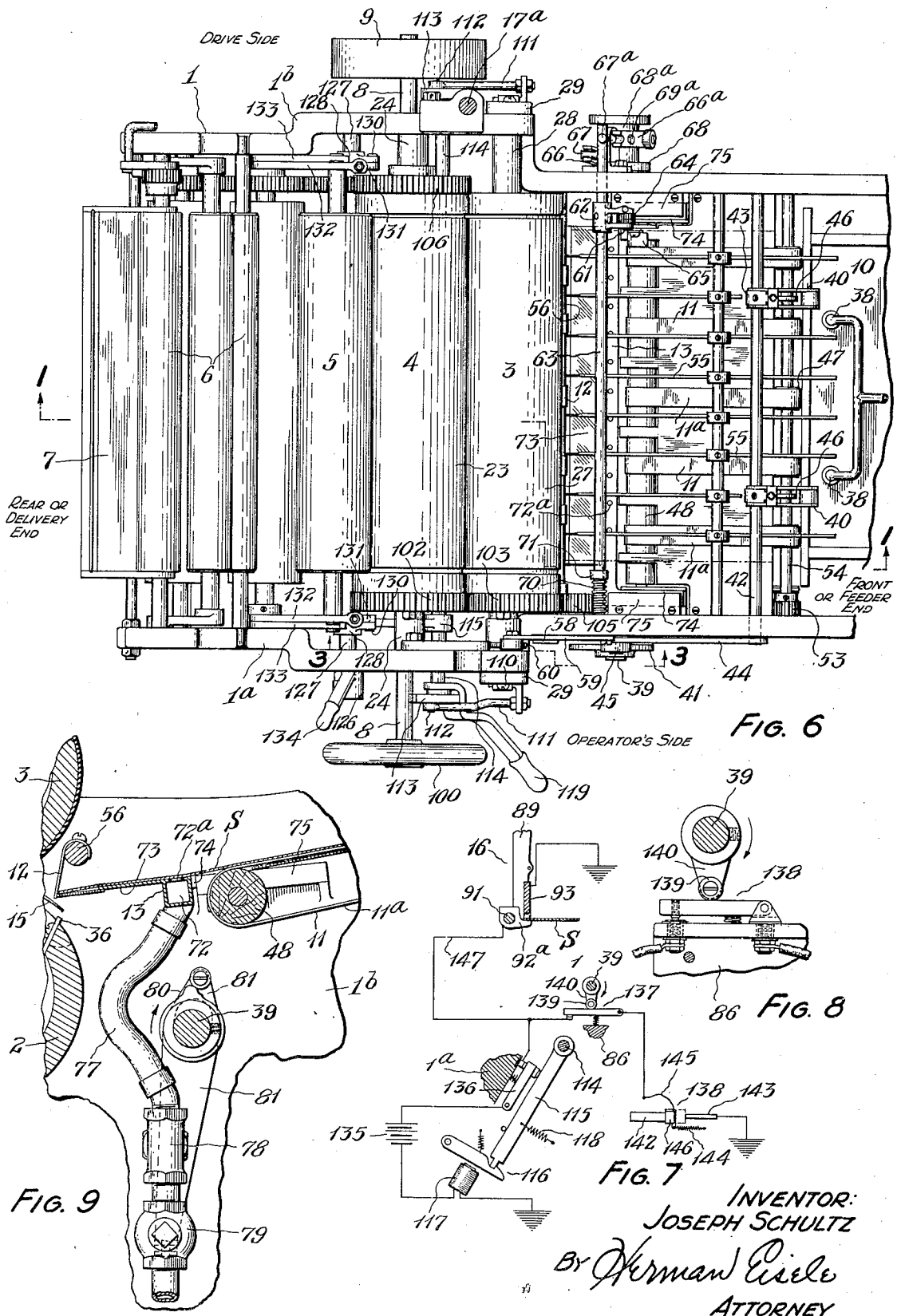
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METHOD OF AND MECHANISM FOR FEEDING SHEETS IN LITHOGRAPHIC PRESSES

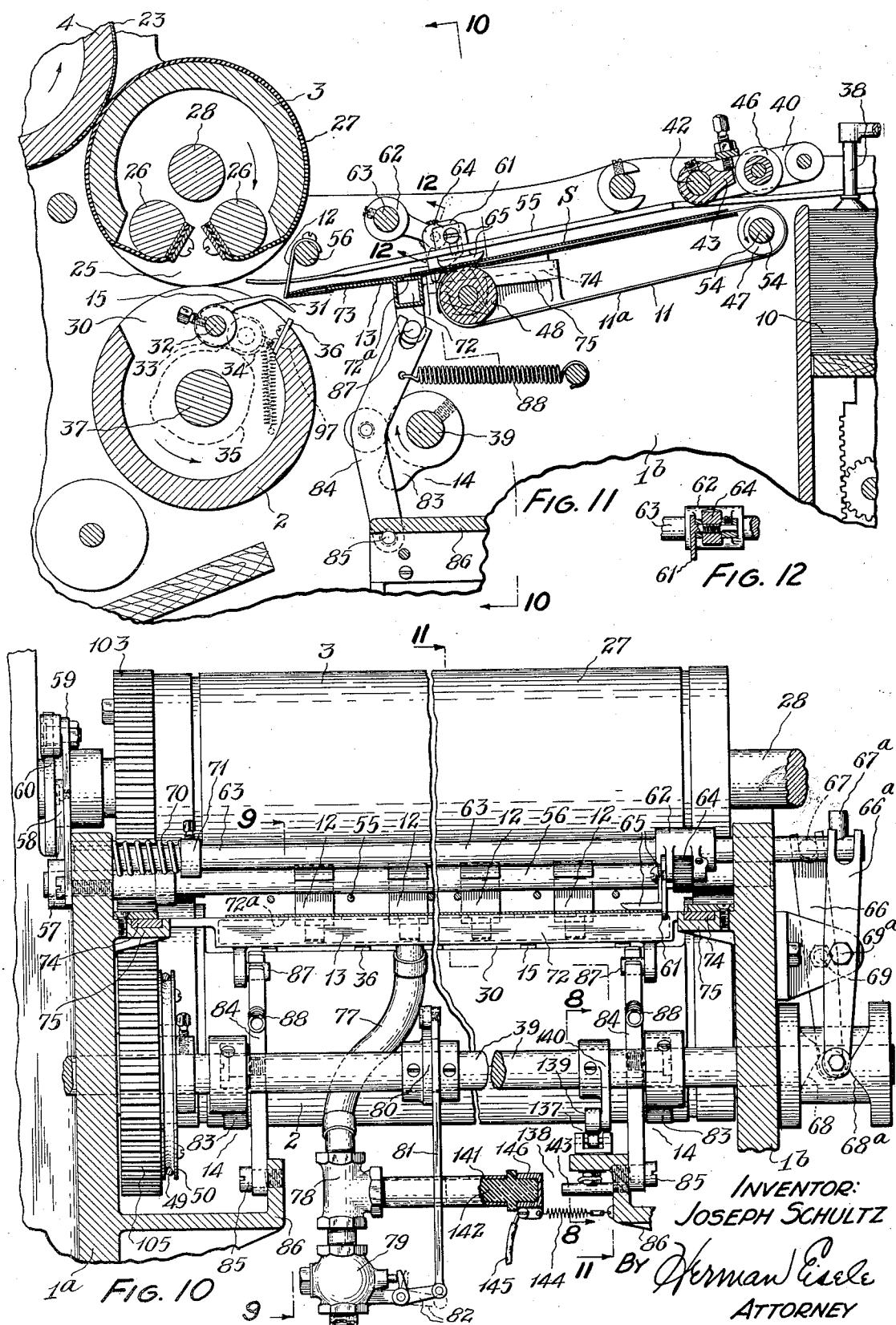
Filed July 28, 1932

5 Sheets-Sheet 2



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5 Sheets-Sheet 3



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METHOD OF AND MECHANISM FOR FEEDING SHEETS IN LITHOGRAPHIC PRESSES

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5 Sheets-Sheet 4

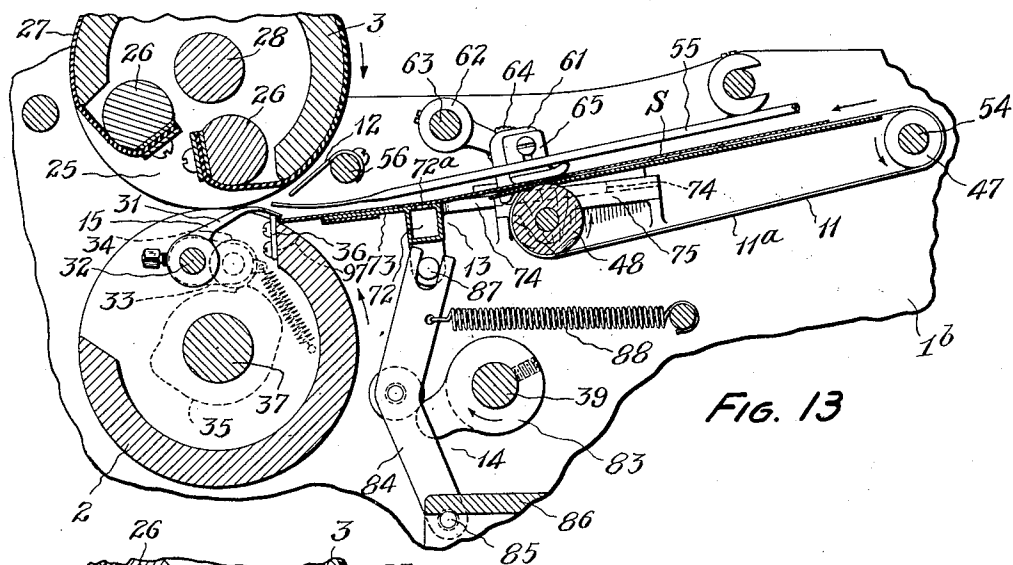


FIG. 13

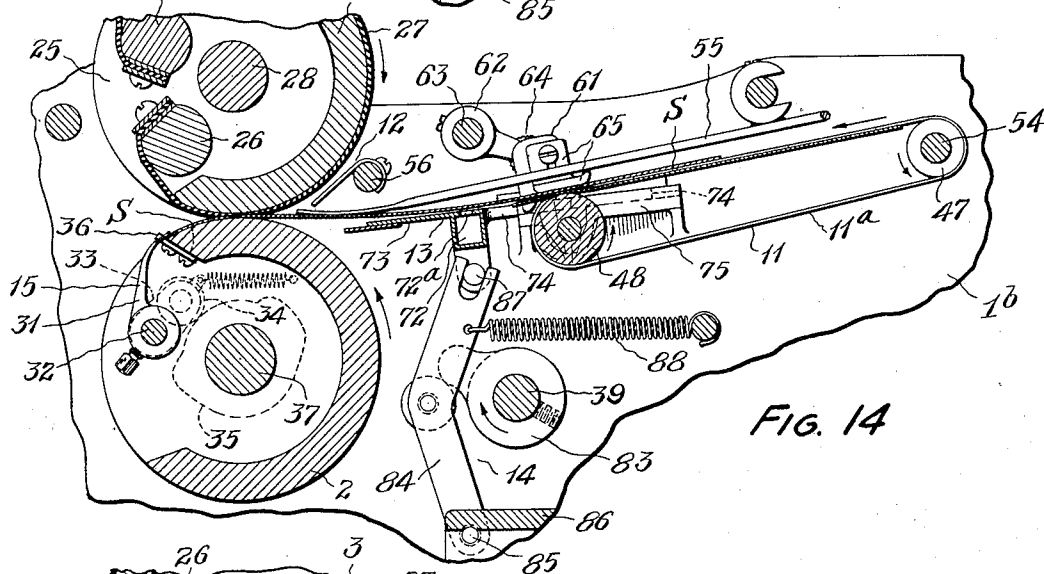


FIG. 14

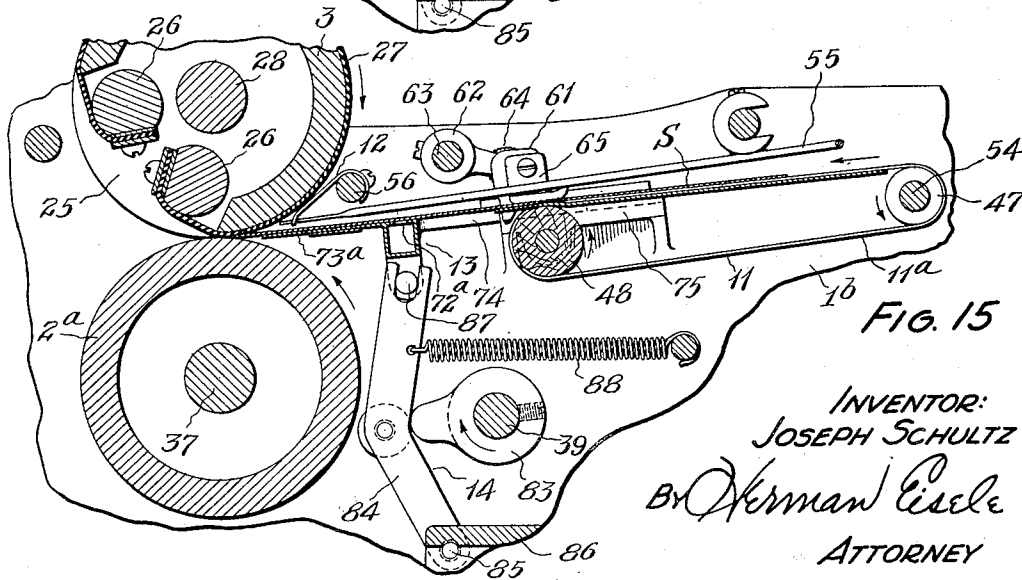
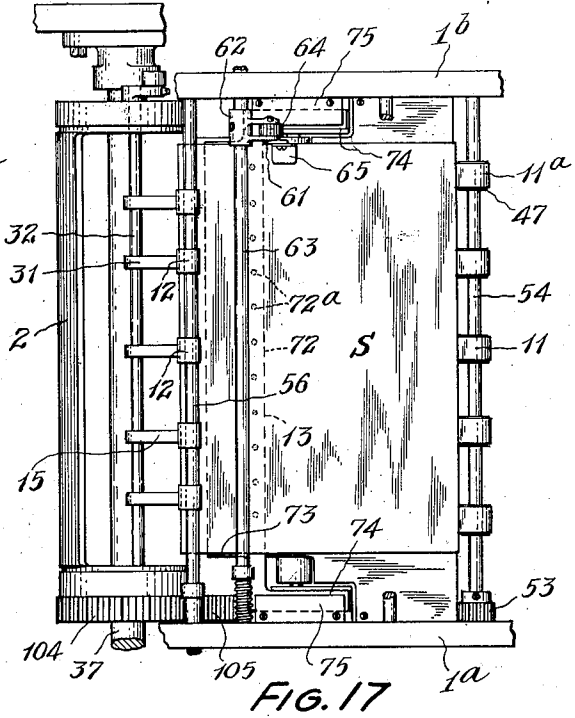
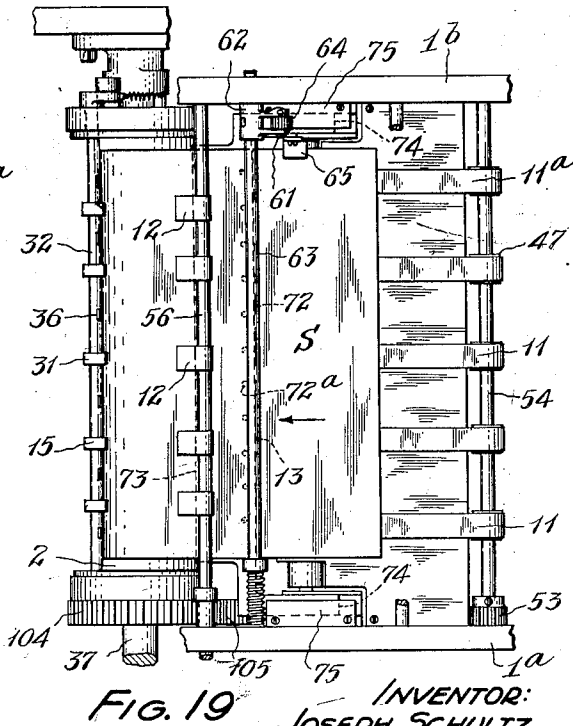


FIG. 15

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5 Sheets-Sheet 5.



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UNITED STATES PATENT OFFICE

1,976,582

METHOD OF AND MECHANISM FOR FEED-
ING SHEETS IN LITHOGRAPHIC PRESSES

Joseph Schultz, Cleveland, Ohio

Application July 28, 1932, Serial No. 625,394

20 Claims. (Cl. 271—53)

This invention relates to apparatus for feeding sheets into printing devices and more specifically to apparatus of this class suitable for feeding sheets into lithographic offset presses. Such feeding apparatus usually comprises mechanism for lifting the sheets to be printed, one by one, from a suitably mounted stock pile, mechanism for conveying the sheets toward the printing cylinders, mechanism for squaring and aligning or "registering" the sheets, mechanism for feeding sheets to the cylinders and, in some cases, mechanism on the cylinders for gripping the sheets and carrying them between certain of the cylinders for the purpose of applying the design thereupon. This particular invention relates to that portion of the above described apparatus which has to do with the squaring and aligning or "registering" of the sheets and feeding them into the bite or gripping mechanism of the cylinders. It also relates to certain safety features provided to avoid cumulative spoilage and delays in the operation of the press in the event that the feeding apparatus "misses" one or more sheets.

This invention comprises novel mechanisms which, while they are capable of producing superior printed work of all kinds, are particularly advantageous for the production of work in which the impression must be placed in identically the same position on each sheet, or for the production of work known as two color work or multicolor work, in which two or more colors are printed on the same sheet in successive impressions, and in which these colors must accurately register one with the other.

Certain features of this invention described and/or shown in this application, and not claimed herein, are claimed in other applications corresponding with this application and entitled respectively: Lithographic offset presses, Serial No. 614,408, filed May 31, 1932, and Methods of and apparatus for dampening in lithographic presses, Serial No. 625,395 filed July 28, 1932.

As is well known, to those skilled in the art of lithography, it is very difficult to produce a sheet printed in more than one color, that is, a multicolor job, without a great deal of care and vigilance especially at high speeds of printing. This is due to a number of factors principal among which is the inability of the press to accurately control the positioning of the sheet for successive impressions to produce the desired accuracy of register. This defect is caused partly by the vibration of the press, partly by the dancing or bouncing of the sheet during and after positioning, partly by the overtravelling of the

sheet caused by the momentum imparted to the sheet by the impact of the rapidly moving registering guide devices before the sheet is held in registered position, and partly by the fact that the sheet must be released just prior to the actual gripping of the sheet by the printing cylinders.

It is also well known that, in multicolor work, it is necessary to delay the second or subsequent printing of a sheet until the first color has thoroughly dried. This is especially true where the preceding color has been printed heavily or in solid colors. The passing of the sheets into the press for a subsequent printing before the preceding printing has thoroughly dried results in smearing, marring, or marking of the sheets due to the contact of the undried coating with the various elements of the sheet feeding apparatus, and particularly by the devices for holding the registered sheet and feeding the registered sheet into the cylinders.

One of the objects of this invention is, therefore, to provide a lithographic offset press which comprises a more efficient registering mechanism and which is therefore capable of producing a more accurately registered printed sheet in single or in multiple color work than is usually produced in this type of press.

A further object is to provide a machine adapted to run at a greater number of impressions per unit of time, and which will accordingly produce a larger quantity of improved work in a given period of time and with less spoilage.

A further object of this invention is to produce a novel method of feeding the sheet from the stock pile to the rotating printing and impression cylinders, the novelty residing particularly in the method of registering the sheet and in the method of feeding the sheet into printing position on the cylinders.

A further object of this invention is to provide mechanism in a press of this type in which it is possible to print a second color on a sheet which has recently been printed or which has been heavily printed, without danger of marring or smearing the recently printed design, or heavily printed area thus enabling a multicolor job to be printed with a minimum of time interval between the printing of the various colors.

A further object of this invention is to provide a novel safety device in a press of this type in which the press is thrown "off impression", when no sheet is in position to be fed into the cylinders, thereby preventing the coating of the impression cylinder and other disadvantages.

A more specific object is to provide a registering or lateral aligning device for a sheet in which the momentum of the sheet, imparted to it by the side guides, is checked or dampened so that the quick lateral striking of the sheet by the side guides, at a high rate of speed, will not cause an overtravel of the sheet beyond the position to which it is to be adjusted in order that it may assume the proper registered position with relation to the design on the printing cylinders.

A further specific object is to provide a sheet registering mechanism which will prevent dancing or vibration of the sheet while it is being positioned.

A further specific object is to provide a device for feeding the sheet to the printing position on the cylinders which will firmly hold the sheet in the registered position until the sheet is firmly mounted in position on the cylinders.

A further specific object is to eliminate any intentional contact of that surface of the sheet to be printed by any feeding device or element used to feed the sheet into engagement with the cylinders.

Further objects and advantages of this invention will appear from the following description and from reference to the accompanying drawings. These annexed drawings and description set forth in detail certain means embodying this invention, such disclosed means constituting however, but a few of the forms in which the principle of this invention may be applied.

In said annexed drawings:

Figure 1 is a longitudinal section of a lithographic offset press embodying my invention, certain portions of the press which are not a part of this invention being omitted, this view being taken on the plane indicated by line 1, 1 in Figure 6.

Figure 2 is a fragmentary side elevation of a lithographic press shown in Figure 1, this view showing the operator's side of the press.

Figure 3 is a fragmentary longitudinal sectional view showing details of mechanism for actuating certain disappearing stop fingers, this view being taken on the plane indicated by line 3, 3 in Figure 6.

Figure 4 is a fragmentary sectional view illustrating one detail of this invention, this view illustrating an eccentric shiftable bearing for the blanket cylinder of this press, and being taken on the plane indicated by line 4, 4 of Figure 2.

Figure 5 is a fragmentary view similar to a portion of Figure 1 showing, however, certain parts in an alternative position.

Figure 6 is a plan view of this improved lithographic press, this view being taken from the plane indicated by line 6, 6 in Figure 1 and omitting the dampening device, as indicated by said line, for the purpose of more fully disclosing certain features of this invention.

Figure 7 is a diagram showing the electrical control system of a certain safety throw-off device forming a part of this invention.

Figure 8 is an enlarged elevational view of a switch mechanism constituting one of the elements of the electrical control system, this view being taken from the plane indicated by line 8, 8 in Figure 10.

Figure 9 is an enlarged view of certain suction control mechanism, this view being taken from the plane indicated by line 9, 9 in Figure 10.

Figure 10 is an enlarged transverse sectional view taken on the plane shown by line 10, 10 in Figures 1 and 11.

Figure 11 is a longitudinal sectional view showing certain sheet feeding mechanism, this view being taken on the plane indicated by line 11, 11 in Figure 10.

Figure 12 is a sectional view illustrating the details of an adjustment shown in Figure 11, this view being taken on the plane indicated by line 12, 12 in said figure.

Figure 13 is another view similar to Figure 11, but showing certain sheet feeding mechanism in a position slightly advanced from that shown in Figure 11.

Figure 14 is likewise a view similar to Figures 11 and 13, showing the sheet feeding mechanism in a still further advanced position.

Figure 15 is a view similar to Figure 13 but showing this invention used with a modified form of cylinders.

Figure 16 is a sectional plan view taken on the plane indicated by the line 16, 16 in Figure 1, showing the sheet about to be printed in this improved lithographic offset press, in the position which the sheet occupies after it has been fed against certain disappearing stop fingers and prior to the lateral positioning for the purpose of registering the sheet with the design on the cylinder.

Figure 17 is a view similar to Figure 16 after the lateral positioning has been completed, this view and Figure 16 corresponding in respect to the positioning of the sheet, to Figure 11.

Figure 18 is a view similar to the two preceding views showing the sheet about to be printed, advanced to a position against certain stops on the impression cylinder, this view corresponding to Figure 13 in respect to the position of the sheet.

Figure 19 is another view similar to Figures 16, 17 and 18 showing the sheet seized by certain gripper fingers on the impression cylinder, this view corresponding to Figure 14 in respect to the position of the sheet.

In the drawings, only so much of a lithographic offset press is illustrated as bears direct relation to this invention.

The drawings illustrate one form of this invention in general and detail views, and the drawings further illustrate a modified form of this invention. This invention is shown, in the preferred form, embodied in a relatively small lithographic press which is especially designed for high speed production of first quality work, but it will be understood that this invention can equally well be applied to lithographic presses of larger sizes with proportionately greater advantages resulting from its use with such larger presses.

General description

I shall first describe the several principal features of this improved press in general terms, and shall later describe the novel features more specifically.

Referring particularly to Figures 1, 2 and 6, 1 indicates the frame of the press comprising side frame 1a on the operator's side and side frame 1b on the drive side of the press. Upon these frames are mounted, in suitable bearings, an impression cylinder 2, a blanket cylinder 3, and a plate cylinder 4. The plate cylinder receives its coating of ink from a plurality of plate inking or form rollers 5, two being shown in the drawings. These plate inking rollers in turn, receive uniformly distributed ink from a series of ink rollers 6 which are, in turn, supplied with ink from an ink fountain 7, in a well known manner.

The shaft 8 is the main drive shaft for this press and is driven by a belt mounted on the pul-

ley 9. Sheets S to be printed are fed into this press from a stock pile 10 upon a tape conveyor 11 which carries them against suitable disappearing stop fingers 12 where the sheet is positioned for proper registry with the design on the plate. After the sheet S is properly registered, it is fed to the impression cylinder by a suction head 13 actuated by cam mechanism indicated generally at 14. For seizing the sheet, the rotating impression cylinder is provided with suitable grippers mechanism indicated at 15 actuated by timed mechanism to be hereinafter described. The gripper mechanism 15 is adapted to seize the sheet and cause it to travel between the peripheries of the blanket cylinder 3 and impression cylinder 2, where the sheet secures its impression. After the sheet has thus been printed, the gripper fingers feed the sheet to a delivery mechanism indicated in its entirety at 16.

The dampening device indicated in its entirety at 17 is adapted to supply moisture to the plate cylinder 4 as clearly shown in Figure 1. The moisture is supplied through a plurality of adjustable wicks 18 which transfer moisture to an apron 19 gravitationally riding on the plate mounted on the plate cylinder and coating the plate cylinder with the desired amount of moisture. This apron is caused to reciprocate crosswise of the movement of the plate by suitable gear driven cam mechanism. The moisture supplied by the adjustable wicks can easily be regulated by the adjustment of the individual wicks so that the moisture supplied to each portion of the plate will be in proportion to the requirements of that portion of the plate. The complete details of the construction, operation and advantages of this dampener are pointed out and claimed in my co-pending application entitled: *Methods of and apparatus for dampening in lithographic presses*, application Serial No. 625,395.

As pointed out in this application the entire dampening device 17 is pivotally mounted on a pin 17a, Figure 6, so that it may be swung or shifted about the pin 17a as a pivot away from the plate cylinder.

Description of cylinders and their arrangement

The details of the plate cylinder, blanket cylinder and impression cylinder, necessary to the understanding of this invention, and the arrangement of the cylinders which is considered one of the novel and advantageous features of this invention will now be described.

The plate cylinder 4, is formed with a gap 21, in which are mounted plate holding devices 22 adapted to firmly hold the plate 23 in position upon the cylinder. The plate holding devices may be of any desired construction, and include adjusting means adapted to position the plate properly on the cylinder. This plate cylinder is fixedly mounted on a shaft 24, which, in turn, is mounted in suitable bearings in the side frames 1a and 1b.

The blanket cylinder 3 is likewise formed with a gap 25 in which is mounted mechanism 26, which may be of any desired construction, adapted to hold the blanket 27 securely on the blanket cylinder 3. The blanket cylinder is fixedly mounted on a shaft 28 which is mounted in eccentric shiftable bearings 29, Figures 2 and 4, in side frames 1a and 1b. These eccentric bearings are provided for the shaft 28 for the purpose of spacing the blanket cylinder 3 from the adjacent plate cylinder 4 and impression cylinder 2 when it is desired to throw the press "off impression".

These bearings are held in place and are shifted by suitable controlling mechanism which will be hereinafter described.

The impression cylinder 2 is likewise formed with a gap 30 in which is mounted the gripping mechanisms indicated in its entirety at 15 and which can best be understood by reference to Figures 1, 11, 13 and 14. This mechanism consists of a plurality of gripper jaws 31 fixedly mounted on the gripper shaft 32. Likewise fixed on the shaft 32 exteriorly of one of the end walls of the cylinder is a lever 33 upon which a roller 34 is rotatably supported. This roller is held against the surface of a stationary cam 35 by means of a spring anchored on the cylinder end wall. The impression cylinder 2 is also provided with stops 36 against which the leading or gripper edge of the paper strikes as the paper is fed to the rotating impression cylinder. The contour of the surface of the cam will cause the gripping point of the gripper jaws 31 to rise or fall upon the periphery of the impression cylinder, adjacent to the stops 36, as the impression cylinder rotates. The impression cylinder is fixedly mounted on the shaft 37, which, in turn, is rotatably mounted in the frame members 1a and 1b.

As will be seen from Figure 1, the blanket cylinder 3 is located substantially vertically above the impression cylinder 2, and the plate cylinder is located above but laterally of the blanket cylinder, preferably toward the delivery or rear end of the press. The plate inking or form rollers 5 engage the plate cylinder at the rear or delivery side of the plate cylinder, and all additional inking rollers 6 and inking fountain 7 are located to the rear of the plate inking rollers.

The arrangement of cylinders and ink rollers together with the shiftable of the dampening device provides easy access to a maximum of the peripheral surface of the plate cylinder for the purpose of mounting the plate on the cylinder and adjusting it with relation to the cylinder and for the purpose of inspecting, cleaning or gumming the plate. This arrangement also provides easy access to the blanket cylinder for the purpose of washing the blanket, for changing the packing underneath the blanket, and making any necessary repairs on the blanket.

Sheet feeding apparatus

The sheets S to be printed are placed on the stock pile 10 which is provided with suitable automatic mechanism to maintain the top sheet of the stock pile in the desired position. Suitable sucker tips, such as shown for instance, at 38, actuated from the cam shaft 39 by means of any well known type of mechanism not shown, lift the sheets one by one, and deposit them on the tape conveyor 11. The sucker tips 38 are usually laterally and longitudinally shiftable and may thus be located to contact the sheet at any desired points, this shiftable being especially advantageous when it is desired to print a second color on sheets which are not thoroughly dried. Prior to the depositing of the sheet on the tape conveyor by the sucker tips the roller cage 40 is lifted by means of the cam 41 on the cam shaft 39. This roller cage is again lowered after the sheet S has been placed on the conveyor below the roller cage. Each roller cage consists of a pair of arms mounted on the shaft 42 and adapted to be lifted by a finger on the hub 43 which is fixed to the shaft 42. This shaft is actuated by a lever 44 provided with a roller 45 gravitationally riding upon the cam 41. The cam 41 is so timed that the roller cage 40 will be low-

ered upon the paper as soon as the paper has been deposited below the roller 46 mounted in the roller cage. This roller, by gravity, will frictionally hold the paper to the tape conveyor 11 which will, in turn, cause the sheet to travel rearwardly toward the cylinders on this tape conveyor.

Figure 1 illustrates the roller cage 40 in the raised position ready to receive the sheet from the stock pile 10 and Figure 5 shows the position of this roller cage with the roller resting on the sheet just after the sheet has been deposited on the tape conveyor by the sucker tips 38. The tape conveyor consists of a plurality of individual tapes 11a each mounted on a driving pulley 47 on a shaft 54 and on a tail pulley 48. The driving pulley 47 is actuated by means of a round belt 49 driven by a grooved pulley 50 mounted on the cam shaft 39, Figures 2 and 10. This belt engages a grooved pulley 51 mounted on the idler pin and driving the gear 52, which, in turn, meshes with a gear 53 fixed to the driving pulley shaft 54.

The tape conveyor 11 feeds the sheets, under stationary guide bars 55 against disappearing stop fingers 12 which are fixed on a transverse shaft 56 oscillatorily mounted in the frame 1.

Mechanism is provided for the purpose of oscillating the shaft 56 in order that the fingers 12 may be swung out of the path of travel of the sheet S when it is desired to feed this sheet toward the cylinders. This mechanism consists of a lever 57 Figures 2, 3, and 10 mounted exteriorly of the frame 1a. This lever 57 is connected by means of a link 58 to a pivoted roller lever 59 whose roller is held in contact with the cam 60 mounted on the blanket cylinder shaft 28. It will be evident that this mechanism will cause the stop fingers 12 to "disappear" or swing out of the path of travel of the sheet S when the roller rides on the rising portion of the cam surface and will again move to a position intersecting the path of travel of the paper when the roller travels on the lower cam surface.

The stop fingers 12 are so located that the sheet S comes to rest against the stop fingers when it is in position above the suction head 13. It will be understood that the tape conveyor 11 travels continuously and that when the gripper edge of the sheet is arrested by the stops 12 the light friction of the tape engaging the bottom of the sheet will tend to hold the gripper edge of the sheet against the stops.

While the sheet S is in this position superimposed on the suction head 13 and lightly held against stop fingers 12 the sheet is laterally positioned by means of side guide fingers shown at 61, Figures 1, 6, 10, 11, 12, 13, 14, 16, 17, 18 and 19. These side guide fingers 61 are adjustably mounted on a hub member 62 which is, in turn, slidably mounted on the reciprocable shaft 63 and may be fixedly secured to this shaft by means of a set screw shown in Figure 11. The side guide finger 61 may be laterally adjusted with relation to the hub member 62 by turning the knurled nut 64 engaging a threaded shank on the member 61. The side guide fingers 61 engage the edge of the sheet as clearly shown in Figure 10. A shoe 65 is vertically adjustably mounted on the side guide finger 61 and is provided to prevent the edge of the paper from folding upwardly or curling upwardly at the edge which is engaged by the side guide finger 61.

The shaft 63 is adapted to be reciprocated in timed relation by means of a lever 66 formed with a slot at one end adapted to engage the

pin 67 on the shaft 63, and provided at its other end with a roller adapted to engage a face cam 68. This lever is pivoted intermediate its ends at 69 upon a bracket secured to the frame 1b. The roller on the lever 66 is held in engagement with the face cam 68 by means of a spring 70 interposed between the frame 1a and a collar 71 adjustably fixed on the shaft 63.

It will now be understood that the side guide fingers 61 will move the sheet S to the desired lateral position which will be determined by the desired location of the sheet with relation to the design on the plate. It will also be apparent that the side guide fingers will move outwardly from the center of the press to allow ample clearance for the next succeeding sheet to move to its position against the stop fingers 12.

It will be understood that in some cases it is necessary to position the sheet from the edge opposite to that shown in Figures 6, 10, 16, 17, 18 and 19. If this is necessary side guide finger 61 together with the hub member 62 and shoe 65 are removed from the shaft 63 and after being properly re-arranged, are placed on the left end of the shaft 63 as viewed in Figure 10. The spring 70 and a collar 71 are at the same time removed to the right side of the press, the spring abutting against the frame 1b. The shaft 63 is then turned approximately ninety degrees to cause the pin 67a to engage the slotted end of lever 66a which is pivoted at 69a and which is actuated by the face cam 68a. The cam will thus cause the side guide finger to engage the left edge of the sheet as viewed in Figure 10 in the positioning of the sheet. This shiftable adaptation of the parts of the side guide mechanism makes possible a quick change from right side guide to left side guide or vice versa.

It will be understood that in a high speed press, such as the one in which this invention is embodied, the side guide fingers will necessarily strike the sheet with a very quick motion and that the impact of these side guide fingers would normally impart sufficient momentum to the sheet to cause it to overtravel. It will also be understood that a high speed machine normally causes considerable dancing or vibration of the sheet during the positioning or after the sheet has been positioned. This vibration naturally seriously affects the accuracy and uniformity of the register. In order to eliminate the defects mentioned, and for the purpose of positively feeding the registered sheet to the grippers on the impression cylinder, the suction head 13 and associated apparatus have been provided.

The suction head 13 consists of a hollow chamber 72 and a table-like extension 73, Figures 10, 11, 13 and 14. The upper wall of the hollow chamber 72 is formed with openings 72a. This suction head is further provided with a rearwardly extending slide 74 on each side, which slides are reciprocably mounted in slideways 75 formed in the frames 1a and 1b.

For the purpose of applying suction to the head 13 a suction pump 76, Figure 1, is provided. This pump may be of any desired type and is preferably driven by a motor, not shown. The inlet or suction end of this pump is connected to the suction conduit 77 which communicates with the hollow chamber 72 in the suction head 13. Interposed between the suction conduit 77 and the pump is a T 78 forming a lateral opening for a purpose to be hereinafter pointed out. A valve 79 is also interposed between the pump and the suction head 13, Figures 1, 9 and 10, and this valve

serves to control the application of suction to the head in the desired timed relation. This valve is controlled by a cam 80 mounted on the cam shaft 39. This cam engages a roller at the upper end of the link 81, Figures 9 and 10, this link being suitably guided at its upper end to hold the roller in engagement with the cam surface. The lower end of the link is pivotally connected to the bell crank lever 82 which serves to open the valve when moved upwardly and serves to close the valve when moved downwardly as will be understood.

In order to eliminate the overtravelling, vibration or dancing of the sheet referred to above, the control mechanism of the valve 79 is so timed that a slight amount of suction will be applied to the underside of the sheet through the openings 72a in the suction head just prior to the completion of the positioning of the sheet on the suction head. This suction is not sufficient to offer any resistance to the movement of the sheet by the side guide fingers; it is just sufficient to dampen any tendency of the sheet to dance or overtravel. The timing of the control for the valve 79 is so adjusted that, as soon as the side guide finger has positioned the sheet, the valve will be opened wider, and substantially the full suction will be applied to this sheet through the openings 72a formed in the top of the hollow chamber 72. This suction firmly holds the sheet to the suction head. The sheet is then ready to be moved into gripping relation with the impression cylinder and the suction head is reciprocally mounted in the frame for movement toward and from the impression cylinder for this purpose.

In order to move the suction head 13 and thus the sheet S toward the impression cylinder, the cam mechanism 14 is provided. This cam mechanism 14 consists of a cam 83 mounted on the cam shaft 39. This cam mechanism, Figures 10, 11, 13 and 14 consists of a pair of cams 83 mounted on the cam shaft 39. Each cam engages a roller mounted intermediate the ends of a lever 84. The lower end of each lever 84 is pivoted at 85 on a bracket 86 formed on the frame members 1a and 1b. The upper end of each lever is formed with a slot engaging a pin 87 on the suction head 13. A spring 88 is attached to the lever 84 and to the frame and serves to hold the roller against the face of the cam 83. It will be apparent that the rotation of the cam will cause the suction head to move toward and from the gripping mechanism 15 in the slideways 75, the spring 88 being of sufficient strength to cause the suction head to return to its starting position.

The suction applied to the underside of the sheet S through the openings 72a in the suction head 13 firmly holds the sheet to the suction head. The movement of the suction head is so timed that the leading or gripper edge of the sheet S contacts the stops 36 on the impression cylinder just prior to the completion of the stroke of the suction head. At this instant the gripping mechanism 15, previously described, is actuated to seize the sheet and hold it firmly to the impression cylinder.

Sheet delivery mechanism

After the gripper edge of the sheet has received the impression from the blanket cylinder, this edge is transferred to the delivery mechanism which is indicated in its entirety at 16. This delivery mechanism consists of a pair of arms 89 fixed on a shaft 90 which is pivotally mounted in the frame 1 of the press, the arms 89 supporting

the gripping portion of the delivery mechanism. The shaft 90 is oscillated in timed relation by means of any desired rocking mechanism not shown, but preferably actuated by the cam shaft 39. Rotatably supported on the lower ends of the arms 89 is a gripper shaft 91 upon which are fixed a plurality of gripper fingers 92. These fingers are adapted to contact a gripper bar 93 secured to the arms 89.

A spring 94 is provided which tends to rotate a gripper shaft 91 and the fingers 92 mounted thereon in a counter clockwise direction, as viewed in Figure 1. The gripper fingers 92 are moved to the open position when the lever 95 fixed on the shaft 91 strikes against a pin 96 adjustably mounted in the frame 1 of the press, as shown in Figure 1. Under the control of a detent, not shown, the gripper fingers remain in the open position as shown in Figure 1, until the gripping face of the fingers 92 and the opposed gripping face of the bar 95 straddle the leading or gripper edge of the sheet on the rotating impression cylinder 2. At this instant the detent is released by suitable mechanism, and the fingers 92 quickly move toward the bar 93 under the influence of the spring 94, thereby firmly gripping the leading edge of the sheet. Recesses are formed adjacent the gripping edge of the impression cylinder 2 as shown at 97, to permit the fingers 92 to engage the underside of the sheet. The gripping fingers 92 and gripping bar 93 maintain their grip on the sheet S, moving at a speed in unison with the peripheral speed of the impression cylinder, until the lever 95 again strikes the adjustable pin 96, at which time the gripping fingers 92 are spaced from the gripper bar 93 and the printed sheet is deposited upon the delivery pile indicated at 98.

Drive

The power means for driving this press may be of any desired type, but preferably consists of a belt actuated by a motor, and running over the pulley 9 mounted on the main drive shaft 8. The pulley is mounted on one end of the drive shaft and a hand wheel 100 is mounted on the other end of this shaft at the operator's side of the machine. Mounted on this shaft 8 between the side frames 1a and 1b is a driving pinion 101, this pinion, as shown in Figure 3, drives the gear 102 adjustably mounted on the plate cylinder. The gear 102 drives the gear 103 adjustably mounted on the blanket cylinder, and the gear 103 in turn, drives the gear 104 which is adjustably mounted on the impression cylinder. This gear 104 drives the gear 105 mounted on the cam shaft 39.

For the purpose of rotating the inking rollers and actuating the dampening device an additional gear may be mounted on the drive shaft 8 which drives the gear 106 loosely mounted on the pulley side of the plate cylinder shaft 24, this gear 106 meshing with a suitable train of gears driving the ink rollers and also meshing with suitable gearing adapted to actuate the dampening mechanism. In some cases, it is satisfactory to fix the gear 106 upon the plate cylinder and, in this event, it is possible to omit the second drive pinion on the drive shaft.

Operation of feeding mechanism

As previously described the sheet to be printed is lifted from the stock pile 10 by suitable suction mechanism and is deposited on moving tape conveyors 11a which carry the sheet against disappearing stop fingers 12 bringing the sheet to

rest, so that a portion, preferably the leading edge of the sheet, will be in position above the suction head 13. The sheet is lightly but positively held against the disappearing stop fingers 12 by the movement of the tapes upon which a portion of the sheet gravitationally rests. At this instant in the cycle the position of the sheet is as shown in Figure 16, the front or gripper edge of the sheet resting upon the table extension 73 of the suction head 13 and against the stop fingers 12. This sheet is fed into the lithographic press in a position, as will appear from Figure 16, farther toward the right or drive side of the press than the registered position. At the instant when the sheet contacts the stop fingers 12, the side guide 61 moves toward the sheet and shifts the sheet to the registering position. A slight suction is applied to the sheet through the openings 72a in the suction head for the purpose of preventing the overtravelling of the sheet as previously explained. The sheet is now in the registered position as shown in Figures 11 and 17, and the full suction is applied to the underside of the sheet by the suitably timed cam 80 on the cam shaft 39 and its associated valve controlling mechanism. The sheet is thus firmly held to the suction head 13.

This suction head slidably mounted in the slide-ways in the frame, as described, is then positively moved toward the impression cylinder by means of the cam and lever mechanism 14 carrying the positioned sheet with it until the sheet strikes the stops 36 on the impression cylinder 2. The gripping fingers 31 are then actuated to grip the leading or gripping edge of the sheet as explained and the sheet is thus transferred from a fixed position on the suction head to a fixed position on the impression cylinder. At this instant the sheet is in the position shown in Figures 13 and 18. Just prior to the time when the sheet is seized by the gripping mechanism on the impression cylinder, the suction exerted by the suction head upon the sheet is slightly reduced by the suitably timed control mechanism, but some suction is maintained on the sheet until the grippers firmly hold the sheet. This provision is made so that there will be no opportunity for the sheet to dance or otherwise shift during the interval when the sheet is not firmly held. After the gripping fingers 31 are firmly holding the sheet, the suction is completely released from the suction head and the gripper fingers carry the sheet on the periphery of the impression cylinder into contact with the blanket on the blanket cylinder during which contact the sheet receives its impression. The gripped sheet in this printing position is indicated in Figures 14 and 19. When the leading edge of the printed sheet reaches the delivery mechanism, the delivery jaws are suitably positioned and tripped to seize the leading edge of the printed sheet, simultaneously with which the gripper jaws on the impression cylinder release the sheet and the printed sheet is deposited upon the delivery pile 98.

It will be understood that the suction head, after delivering the sheet to the impression cylinder, returns to the starting position to receive the next sheet from the tape conveyor, under the control of the cam mechanism 14 and the spring 88.

Due to the fact that each sheet to be printed is placed in identically the same position with relation to the suction head 13 and is firmly held thereto after it is positioned, and due to the fact that this suction head is mechanically moved

during each cycle to identically the same position with relation to the impression cylinder, and due to the fact that the leading or gripper edge of each sheet is delivered in identically the same manner to the same stops on the impression cylinder, and due to the fact that the gripper fingers on the impression cylinder firmly hold the leading edge of the sheet against these stops, the sheet will, at each impression, engage identically the same portion of the blanket cylinder, measured from the gripper edge and from the side guided edge. This insures the location of the design on identically the same position on all sheets, and enables the lithographer to produce extremely accurate registry in two or more color work. It will be apparent that, at no time, is the sheet free to move from the time when it is registered until the impression is applied.

Modified form of feeding mechanism

My improved feeding mechanism is also adapted to feed sheets to a printing couple in which the sheet is delivered directly into the bite of the blanket cylinder and impression cylinder, and in which no gripper fingers are associated with the printing couple. Figure 16 shows an adaptation of my invention to such a printing couple. In this figure the blanket cylinder, tape conveyor, side guide adjustment, suction head, and the suction head actuating mechanism are all substantially the same as in the form of the invention previously described. The impression cylinder 2a is a plain cylinder without a gap and without gripping mechanism. The suction head is formed with a somewhat longer table extension 73a which very nearly reaches the bite of the printing couple so that the sheet may be guided into the bite as accurately as possible. This mechanism does not produce the accuracy of registry which is possible when the sheet is fed against stops and is held by grippers on the impression cylinder but produces very accurate results due to the accurate positioning of the sheet prior to the feeding to the printing couple.

Safety impression throw-off mechanism

The safety impression throw-off is provided for the purpose of making the press inoperative when the press misses a sheet so as to prevent the transfer of the impression from the blanket cylinder to the impression cylinder in the event that no paper is between these cylinders and also to prevent other well known disadvantages. When no sheet is fed to the impression cylinder by the suction head or when the sheet is located on the suction head in a twisted or other radically incorrect position the throw-off mechanism is caused to function.

More specifically, the throw-off mechanism is adapted when actuated, to space the plate, blanket and impression cylinders one from the other. This is accomplished by moving the blanket cylinder upwardly and to the right as viewed in Figure 1. This mechanism is also adapted to space the plate inking rollers 5, 5 from the plate cylinder. This mechanism is also adapted to stop the feeding of any additional sheets from the stock pile 10. Thus three separate movements are controlled by throw-off mechanism which will only be briefly described, as nothing is claimed in this application for the specific details of this mechanism.

Referring to Figures 2, 4 and 6, the blanket cylinder 3 is mounted in eccentric shiftable bearings 29, one in each side frame 1a and 1b, the

bearings being rotatably mounted in the side frames and the shaft 28, being eccentrically mounted in each bearing and so positioned that a counter clockwise movement of the bearing 29, as viewed in Figure 2, causes the cylinder to move in a direction from the plate and impression cylinders. Screws 110, passing through slotted arcuate holes in flanges formed in the bearings 29, are provided to hold these bearings in place laterally on the frame, while permitting their rotation with respect to the frames.

The bearings 29 are held in the desired angular position by means of the adjustable connecting rod 111 pivoted on a pin 112. This pin 112 is secured in the hub 113 fixed on a shaft 114 running entirely across the press. Mounted on the shaft 114 and adjacent the inner wall of the frame 1a is a lever 115. This lever is held in position by means of a spring latch 116. This lever thus holds the bearings 29 and hence the cylinder 3 in operative relation with the plate and impression cylinders. The latch normally holds the lever 115 in the position shown in Figure 2. This lever may be released by the energizing of an electro-magnet 117 in a manner to be described. When the lever 115 is thus released it moves in a counter clockwise direction as viewed in Figure 2 under the influence of the spring 118 causing the connecting rod 111 to move to the right and causing the bearing 29 to move counter clockwise, thus moving the shaft 28 upwardly and to the right spacing the blanket cylinder 3 from the plate and impression cylinders. A handle 119 is provided to manually return the mechanism described to the operative position when the electro-magnet ceases to attract the spring latch 116.

The releasing of the lever 115 spaces the blanket cylinder from the plate and impression cylinders, and also causes the spacing of the plate inking rollers from the plate cylinder by means of the following described mechanism. A finger 121 mounted on a pin 122 on the hub 113 and suitably guided, moves downwardly as viewed in Figure 2, when the lever 115 swings in a counter clockwise direction, thus depressing the spring detent 123. This movement releases the arm 124 which moves counter clockwise under the influence of the spring 125. The arm 124 is formed with a hub 126 fixed to the shaft 127 extending across the press. A hub 128 mounted on the shaft 127 inside of the frame 1a formed with an ear 129 provided with an adjusting screw, and a pin 130 upon which an adjustable connecting rod 131 is mounted. The plate inking rollers 5 are mounted in the links 132 and 133. A counter clockwise rotation of the shaft 127 will raise the link 132 upwardly spacing the plate ink roller 5 from the plate cylinder 4, and likewise with a counter clockwise rotation the screw operating the ear 129 will permit the link 133 to drop by gravity and space the lower plate roller from the plate cylinder 4. A handle 134 is provided for the purpose of resetting the plate ink rollers in the operative position.

While only one side of the mechanism is described, it will be understood that similar parts are mounted on the other or drive side of the press, see Figure 1, as far as such parts are necessary to actuate the mountings on the drive side simultaneously with the mounting on the operator's side, so as to move the blanket cylinder and plate inking rollers in parallel relation with the plate and impression cylinders.

Control for impression throw-off mechanism

The throw-off mechanism remains in position,

and holds the blanket cylinder 3 and the inking rollers 5 in operative position, being arrested or restrained by the releasing device as described, so long as the sheets are properly fed, one by one, to the printing couple. When a sheet misses however, the releasing device is actuated to release the lever 115 and the cylinders and plate inking rollers are thrown off impression as previously explained.

The control of the throw-off mechanism will now be described and can best be understood by reference to Figures 2, 7, 8 and 10. One terminal of the electro-magnet 117 is grounded and the other terminal is connected to a circuit including a battery 135. This circuit also includes a switch 136, and a switch 137, and a circuit breaker 138. The switch 136 normally tends to open, but is held in the closed position by the lever 115 when this lever is arrested by the spring detent 116. The switch 137 is a normally open switch, shown in detail in Figure 8, and is closed for an instant once during each impression cycle by means of an insulated roller 139 on a lever 140, adjustably mounted on the cam shaft 39. The circuit breaker 138 will best be understood by reference to Figures 7 and 10. A tube 141 is secured to the side outlet of the T 78, previously referred to, which is mounted in the suction conduit 77. The tube 141 forms the cylinder in which a plunger 142 is movably mounted. This plunger is normally held against the grounded contact 143 by means of a spring 144, the contact 143 being grounded on the frame. A conductor 145 is attached to an insulated cap 146 mounted on the plunger and insulated therefrom.

The operation of this circuit breaker is as follows: The cap 146 is normally held against the pin 143 thus closing the circuit, when the switches 136 and 137 are also closed. If, however, there is sufficient suction in the conduit 77, so as to move the plunger 142 and cap 146 from the pin 143 against the pull of the spring 144, the circuit breaker will prevent the closing of the circuit and thus prevent the energizing of the electro-magnet 117 when the switches 136 and 137 are closed. This spring 144 is so selected that the suction in the conduit 77 will be sufficient to draw the cap 146 from the contact pin 143 providing that the suction pump is operating properly and providing that all of the suction openings 72a in the top wall of the suction head 13 are closed by the sheet resting on the suction head. If however, one or more of these suction openings 72a are exposed, due to the absence of a sheet on the suction head or due to a twisting or shifting of the sheet, the suction will be sufficiently decreased in the conduit 77 to permit the spring 144 to close the circuit.

The switch 137, as will be understood, is closed at a certain instant in each cycle. The cam operating the switch is so timed that this instant is simultaneous with the commencement of the movement of the suction head 13 toward the impression cylinder 2. If, at this instant, the circuit breaker 138 is open, due to the existence of sufficient suction in the conduit 77, then it will be impossible for the switch 137 to energize the electro-magnet 117. If, however, at this instant the vacuum in the conduit 77 has been reduced, due to the fact that the openings 72a are partly or entirely uncovered, the spring 144 will be sufficient to close the circuit breaker, thus permitting the switch 137 to energize the electro-magnet 117, thus releasing the lever 115 and instantly throwing the press off impression.

Accordingly the releasing device is actuated by the energizing of an electro-magnet which is automatically energized at a predetermined instant in each cycle, unless the circuit is open at that instant, through the action of suction on a circuit breaking mechanism. The suction available is sufficient to open the circuit breaker when a sheet is properly placed on the suction head thus closing the air inlet openings in the top of the suction head. If, however, these openings are uncovered the suction or vacuum created by the pump at the circuit breaker is not sufficient to prevent the spring from keeping the circuit closed.

The switch 136 is provided so that, in the event that the press is run idly with the cylinders "off impression" that no current will be used and that no sparking will occur at the switch 137.

Safety impression throw-off at delivery

This feature of the invention relates to a safety device provided to instantly throw the press "off impression" when no sheet is received by the delivery mechanism from the impression cylinder. This protective feature is provided in addition to the safety throw-off device associated with the paper feed, and may act with or independently of this safety throw-off. The independent action of the safety feature on the delivery is required in the event that the sheets are properly fed by the feeding mechanism but, instead of being transferred to the delivery, adhere to the blanket cylinder or to the impression cylinder. The independent action of the safety feature on the delivery is also required in the event that the sheets jam on the suction head. In both of these events, the safety throw-off associated with the paper feed will not operate.

A brief description of safety throw-off at the delivery will now be given with reference to Figure 7. One of the fingers 92a mounted on the shaft 91 of the delivery mechanism is insulated from the shaft and other adjacent mechanism, and has connected to it a conductor 147. This finger 92a is adapted to grip the sheet in the same manner as all of the other fingers 92. When a sheet is received by this delivery mechanism from the impression cylinder, the finger 92a will be insulated by the sheet from the gripper bar 93 and under this circumstance no current will flow through the conductor 147 from the battery 135 to the grounded gripper bar 93, and the electro-magnet will not be energized. If, however, the finger 92a contacts the grounded gripper bar 93, due to the fact that no paper is interposed between the finger and the gripper bar at the instant when the finger closes, the current will flow from the battery to the ground gripper bar and the circuit will accordingly be closed, thus energizing the electro-magnet 117 when no sheet is fed to the delivery mechanism or when a sheet is fed to the delivery mechanism and is not properly gripped by the delivery mechanism.

Conclusion

It will be apparent that the hereinbefore described invention discloses novel apparatus for and an improved method of feeding sheets into and through the printing couple on a lithographic press, providing for the feeding of the sheet to a registering station upon a movable suction head or table, lightly holding the leading edge of the sheet against disappearing stops, laterally positioning or registering the sheet while the leading edge of the sheet is lightly but accurately held against stops, dampening the movement of the

sheet during the lateral positioning to prevent the lateral overtravelling of the sheet, pneumatically holding the sheet firmly to the movable suction head or table, positively moving the suction head with the superimposed sheet toward the impression cylinder, abutting the leading edge of the sheet against stops on the impression cylinder, causing the grippers on the cylinder to seize the leading edge of the sheet, partly reducing the suction on the sheet at the instant of gripping, and completely releasing the suction on the sheet after the sheet has been firmly seized by the gripping mechanism on the impression cylinder.

It will also be evident that this feeding mechanism contacts only one side of the main area of the sheet which is about to be printed, and that this side is the underside of the sheet that is, that face of the sheet reverse from the face to be printed.

It will also be evident that this invention discloses restrained mechanism which is adapted to throw the press "off impression" when no sheet is properly positioned on the suction head at the instant when the suction head is moved toward the impression cylinder. More specifically this restrained or arrested mechanism automatically tends to space the cylinders one from the other and this mechanism is released at a certain instant in each cycle unless the releasing device is rendered inoperative and prevented from functioning, which occurs when a sheet is properly located on the suction head.

Many modifications of this invention and its application will naturally occur to those skilled in this art, and the present disclosures should therefore be considered as typical only, and I desire not to be limited to the exact constructions shown and described.

What I claim as my invention is:

1. The method of feeding a sheet to the printing cylinder of a lithographic press consisting of lightly holding the leading edge of the sheet against disappearing stops, laterally positioning the sheet while said leading edge is in contact with said stops, lightly pneumatically dampening the movement of the sheet during a portion of the lateral positioning, releasing the leading edge of the sheet after said lateral positioning, and feeding the leading edge of the positioned sheet into grippers on a moving cylinder, and causing the grippers to seize the sheet.

2. The method of feeding a sheet to the printing cylinders of a lithographic press consisting of lightly holding the leading edge of the sheet against disappearing stops and adjacent to a suction element, laterally positioning the sheet while said leading edge is in contact with said stops, applying a slight suction to the said sheet substantially at the completion of said lateral positioning, increasing the suction after the completion of the positioning, removing the stops, moving the leading edge of the sheet into gripping engagement with the cylinders, and releasing the suction upon the sheet after the sheet is gripped.

3. The method of feeding a sheet to the impression cylinders of a lithographic offset press consisting of placing a portion of the sheet on a movable support, applying a light suction to the sheet and aligning the sheet while it is movably held by this light suction, moving the leading edge of the sheet into grippers on the impression cylinder and maintaining a light suction on the sheet until the grippers have completed their engagement with the sheet.

4. The method of feeding a sheet to the printing cylinders of a lithographic offset press which consists of the following steps effected successively in the order named, conveying the sheet to a registering station, registering said sheet, pneumatically seizing a portion of that face of the sheet reverse from the face to be printed, and feeding the pneumatically held sheet into gripping engagement with the cylinders.
5. A sheet transferring device adapted to transfer a sheet from a separator and conveyor to the cylinders on a lithographic press, including a reciprocable member adapted to reciprocate from a position adjacent said conveyor to a position adjacent said cylinders and adapted to receive a sheet from said conveyor and to support a portion of the sheet, and mechanism adapted to longitudinally and laterally align the sheet while it is supported on said member.
6. Sheet feeding mechanism for use on a lithographic press and adapted to feed sheets between the impression cylinder and the blanket offset cylinder arranged for printing one side of the sheet, said mechanism including a support movable only toward and from said cylinders and adapted to contact the side of the sheet opposed to that which is about to be printed, means laterally movable relatively to said support and adapted to laterally align the sheet, timed pneumatic means adapted to hold said aligned sheet in contact with the support, and timed actuating mechanism for moving the support toward and from the cylinders.
7. Sheet feeding mechanism adapted for use on a lithographic press, including, in combination, a movable support formed with suction openings and adapted to receive a sheet and feed it to the printing cylinders of the press, means for positioning the sheet relatively to said support, a source of suction, and suction controlling mechanism for applying the suction to the sheet through said suction openings, said mechanism being timed to apply the suction to the sheet just prior to the completion of said positioning.
8. Automatic sheet registering and feeding mechanism adapted for use in a lithographic press, including a reciprocable member formed with suction openings, means adapted to deposit the leading end of a sheet upon said member, removable stops for positioning the leading edge of the sheet, automatically movable side guide means for laterally positioning the sheet, means for actuating said guide means, means for applying suction to said sheet, means for removing said stops, timed means for moving said member toward said cylinders, timed means for releasing the suction, and timed means for returning the member to the sheet receiving position.
9. Automatic apparatus for feeding sheets to the cylinders of a lithographic press, one by one, said apparatus including a removable stop, means for feeding the leading edge of a sheet against said stop, automatically actuated mechanism for laterally aligning said sheet when it is in position against said stop, means for preventing the lateral overtravelling of said sheet during said lateral aligning, means for seizing said aligned sheet, mechanism for removing said stop from the leading edge of the sheet and mechanism for feeding said seized sheet to said cylinders.
10. A sheet transferring device adapted to transfer a sheet from a sheet conveyor to a continuously rotating impression cylinder provided with sheet grippers, including a reciprocable suction element adapted to receive a sheet from the conveyor and transfer the sheet into the grippers on the rotating impression cylinder, timed mechanism for registering the sheet prior to its movement to the cylinder, timed automatic means for controlling the suction exerted by said element and timed means for reciprocating said element toward and from the cylinder.
11. An automatic sheet transferring device adapted to feed a sheet to an impression cylinder provided with sheet grippers, said device including a reciprocable element provided with pneumatic means adapted to engage the sheet with and to release the sheet from said element, guides slidably supporting said element for rectilinear movement toward and from said cylinder, a transversely moving side guide for laterally aligning the sheet, timed mechanism for actuating the side guide, timed mechanism for controlling the pneumatic means and timed mechanism for reciprocating the element in a repeatedly recurrent identical path of travel toward and from the cylinder.
12. A sheet transferring device adapted to feed sheets to the cylinder of a lithographic press, including a suction head movable toward and from the cylinder and a source of suction, said head being adapted to receive a sheet on the upper surface thereof and to draw said sheet downwardly against said head when the suction is applied, timed means for moving said head toward the cylinder to feed the sheet to the cylinder, and timed means for applying and maintaining the suction on the sheet until the sheet has been seized by the cylinder.
13. Sheet feeding mechanism adapted for feeding sheets to the cylinders of a lithographic press, said mechanism including a reciprocable member provided with suction openings, removable sheet stops interposed between said member and said cylinders, a conveyor adapted to feed sheets upon said member and against said stops, timed mechanism for laterally aligning sheets placed upon said member, timed means for intermittently applying suction to said openings and timed mechanism for reciprocating said member toward and from said cylinders in an accurately recurrent path.
14. Sheet feeding mechanism adapted for use on lithographic presses, having an impression cylinder formed with sheet stops and provided with sheet grippers, including a feed table, a travelling conveyor, mechanism adapted to transfer sheets, in timed relation, from said table to said conveyor, a hollow reciprocable support interposed between said tape conveyor and said cylinders and formed with openings in its upper surface, said tape conveyor being adapted to superimpose sheets on said support, a vacuum pump connected with said support and a valve interposed between said pump and said support, removable end stops separate from said cylinder, adapted to align the leading edge of the sheet superimposed on the support, side guide mechanism adapted to laterally align the sheet, timed mechanism for actuating said valve, timed mechanism for reciprocating the hollow support whereby the leading edge of the aligned sheet is moved to intersect the path of movement of the grippers and contact said stops on the impression cylinder, and mechanism for moving the grippers into gripping engagement with the leading edge of the sheet.
15. The method of feeding a sheet to a rotating cylinder of a lithographic press provided with sheet stops and grippers, which consists of con-

veying the sheet to a registering station, registering the sheet, holding the sheet in the registered position by pneumatically seizing a portion of that face of the registered sheet reverse from the face to be printed, positively feeding the leading edge of the seized sheet against the sheet stops and into the gripper jaws on the continuously rotating cylinder.

16. The method of feeding a sheet to the printing cylinders of a lithographic offset press consisting of carrying the sheet on a tape conveyor to a position above the suction surface of a suction element and against disappearing stops, laterally positioning the sheet and holding said sheet to said element with a slight suction during a portion of said lateral positioning, the intensity of said suction being sufficient to prevent the overtraveling of the sheet during the lateral adjustment, increasing the suction after completion of the lateral positioning, moving the suction surface and superposed sheet toward the cylinders, causing the cylinders to grip the sheet, and releasing the suction in the element.

17. The method of feeding a sheet in a lithographic press, consisting of conveying the sheet upon a support and against front stops, positioning the sheet laterally while it is in engagement with said front stops, applying a slight resistance to the lateral movement of the sheet on the support during the said lateral positioning, holding said sheet firmly to the support, and causing the support to feed the sheet against stops adjacent the gripper fingers on a moving impression cylinder, actuating the gripper fingers to grip the sheet, and maintaining a slight resistance to the initial removal of the sheet from the support by the gripper fingers.

18. The method of feeding a sheet to a rotating

cylinder of a lithographic press provided with sheet stops and grippers, which consists of conveying the sheet to a registering station, registering said sheet, holding the sheet in the registered position by pneumatically seizing a portion of that face of the registered sheet reverse from the face to be printed, positively feeding the leading edge of the seized sheet against the sheet stops and into the gripper jaws on the continuously rotating cylinder, and maintaining a reduced suction on the sheet until the sheet has been firmly seized by the grippers.

19. Automatic apparatus for feeding sheets to the cylinders of a lithographic press, one by one, said apparatus including a removable stop, means for feeding the leading edge of a sheet against said stop, automatically actuated mechanism for laterally aligning said sheet when it is in position against said stop, means for seizing said aligned sheet, mechanism for removing said stop from the leading edge of the sheet, and mechanism for feeding said seized sheet to said cylinders.

20. A sheet transferring device adapted to feed sheets to the cylinder of a lithographic press, including a source of suction, a suction head moving toward and from the cylinder in timed relation and adapted to pneumatically seize a sheet when the suction is applied, said movement having a dwell when the suction head is in its position away from said cylinder, means for registering the sheet during the dwell, and timed means for applying suction to suction head during this dwell and prior to its movement toward the cylinder and for maintaining the suction on the head until the sheet is delivered to and is moving with the cylinder.

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