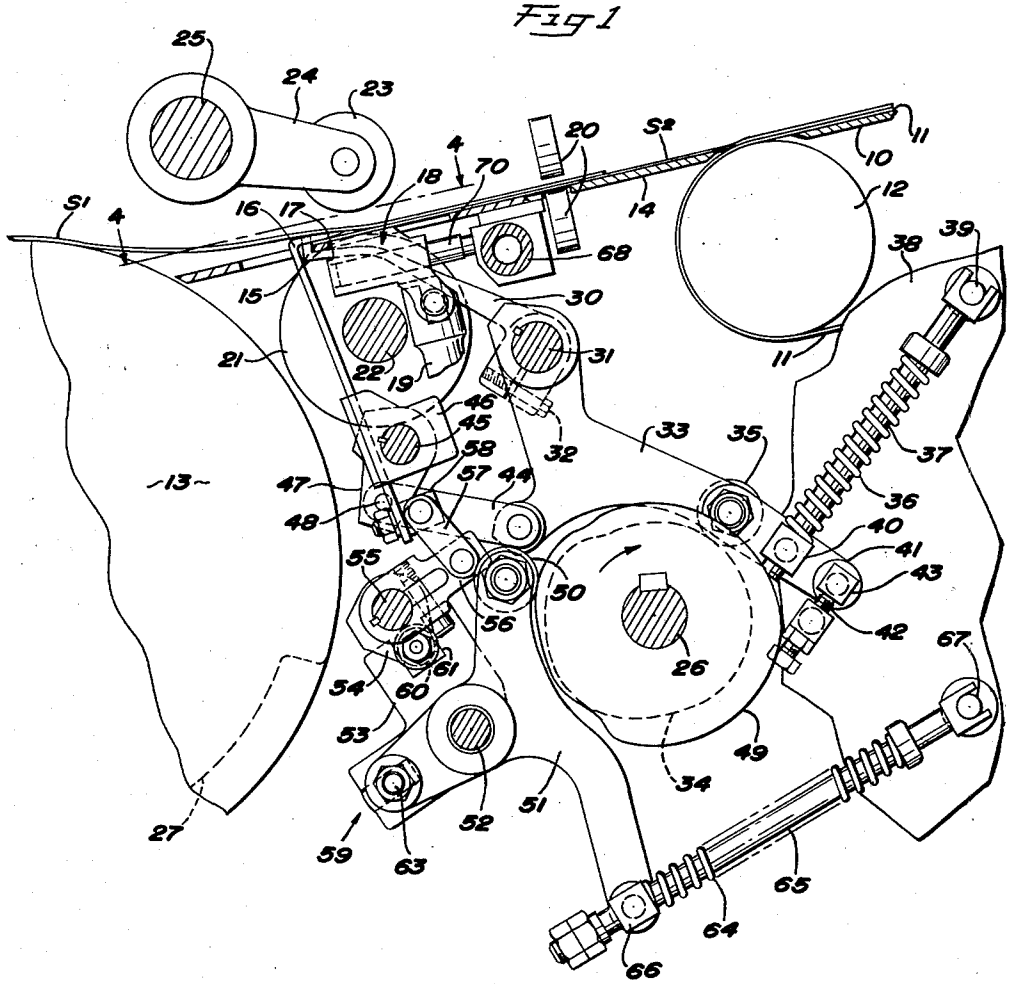
May 16, 1961 K. E. KIST 2,984,483

SHEET REGISTERING MECHANISM AND METHOD

Filed May 8, 1958

4 Sheets-Sheet 1

Fig 1



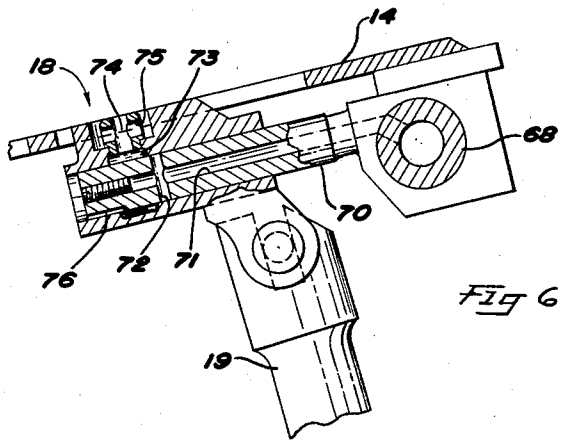


Fig 6

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SHEET REGISTERING MECHANISM AND METHOD

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4 Sheets-Sheet 2

Fig 2

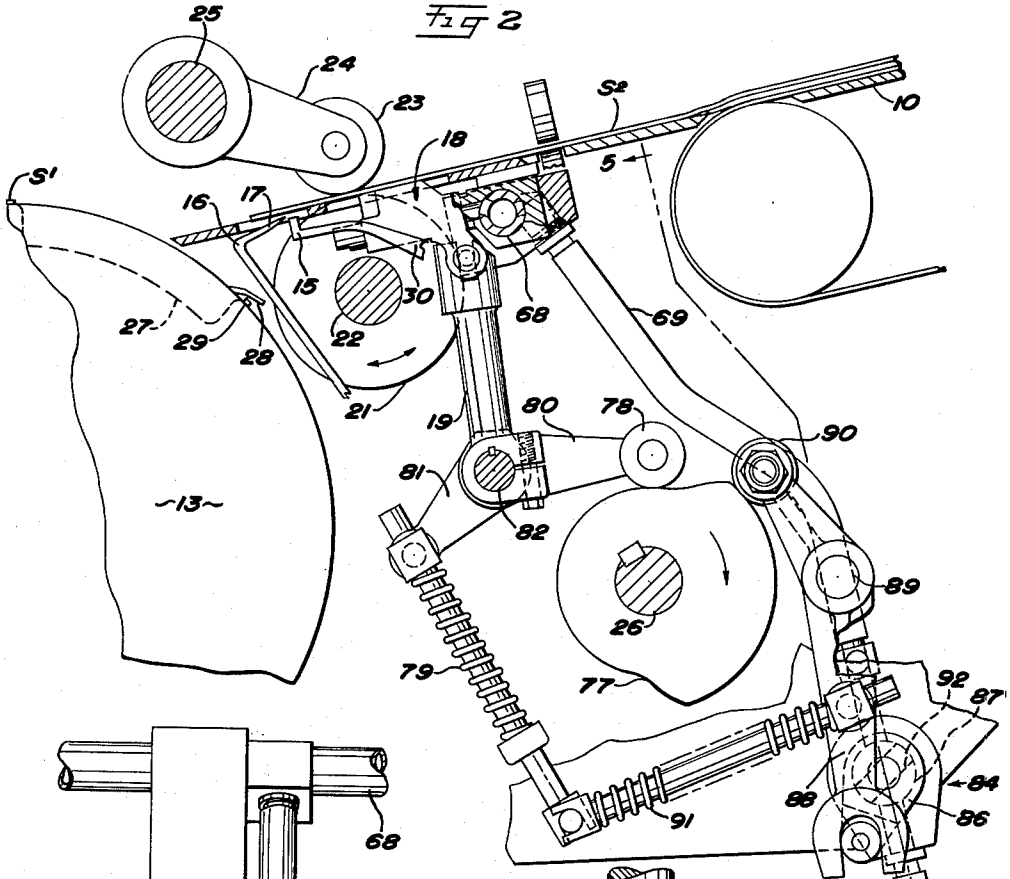

Fig 5

Fig 4

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SHEET REGISTERING MECHANISM AND METHOD

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4 Sheets-Sheet 3

Fig 3

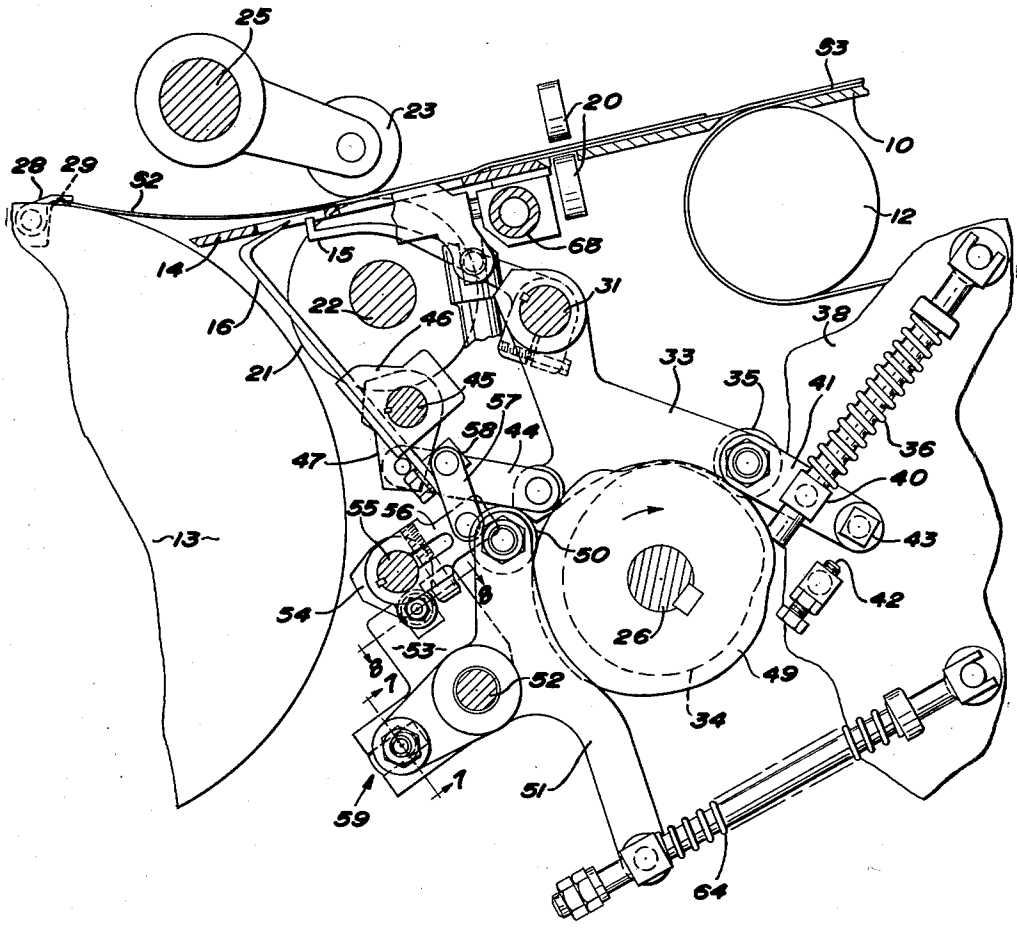


Fig 8

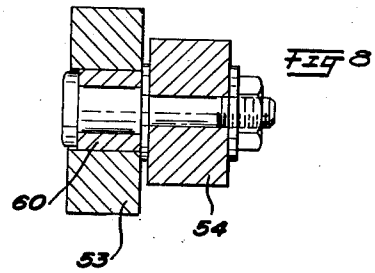
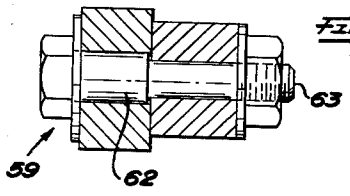


Fig 7



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SHEET REGISTERING MECHANISM AND METHOD

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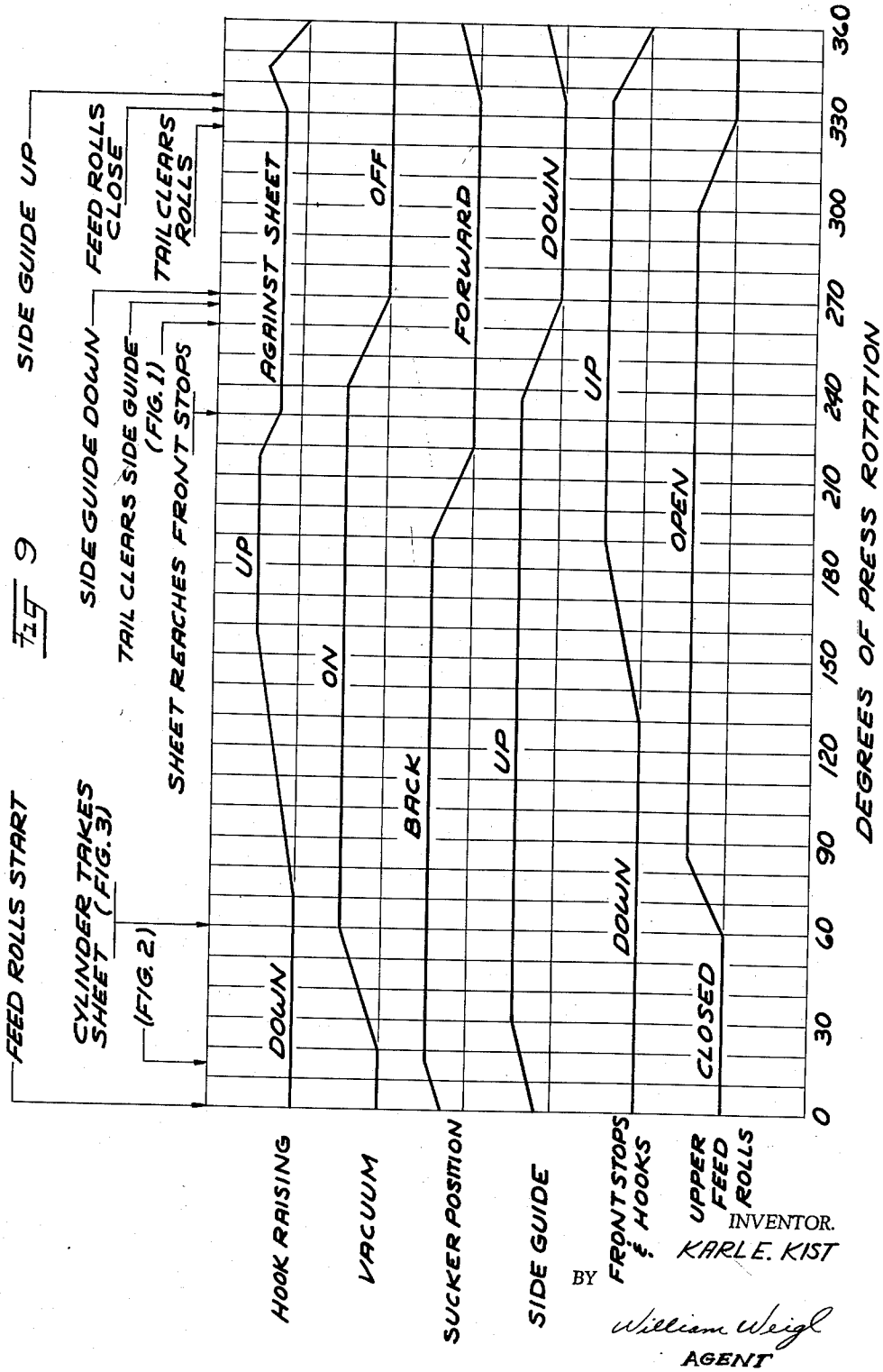

Fig 9

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United States Patent Office 2,984,483 Patented May 16, 1961

2,984,483

SHEET REGISTERING MECHANISM AND METHOD

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Filed May 8, 1958, Ser. No. 734,012

10 Claims. (Cl. 271—58)

This invention relates to sheet registering mechanism of a printing press.

The invention has as its principal object the enabling of feeding sheets in closely-spaced succession to a cylinder of a sheet handling machine.

Another object is to permit further reduction of gap size on the cylinders of a rotary sheet fed printing press than heretofore possible.

A further object is to obtain greater advantage from underneath front registration of underlapped stream-fed sheets than existing commercial machines employing such mechanism.

Another object of the invention is to intercept underlapped stream-fed sheets with hooks and front stops located in a minimum of available space between a feed table and a cylinder to the top side of which sheets are fed.

Still another object is to simultaneously apply suction to the underside of traveling underlapped sheets of a stream at a plurality of transverse points.

Another object is to provide for use in connection with front registering mechanism for underlapped sheets of a stream, a plurality of horizontally traveling suckers with valving directly at the sucker mouths, such valving being operable to open in response to forward movement of the suckers.

Other objects and advantages will be apparent from the following description in which reference is made to the accompanying drawings.

In the drawings:

Fig. 1 is a fragmentary elevational view of sheet registering mechanism of the invention illustrating a position of the parts when an underlapped sheet has arrived at the front stops.

Fig. 2 is a view similar to Fig. 1 showing additional parts in the positions they occupy when a sheet is just about to be forwarded to grippers on a cylinder.

Fig. 3 is a view showing the parts of Fig. 1 in their positions at a time the grippers on the cylinder have just closed on a sheet.

Fig. 4 is a plan view taken along line 4—4 of Fig. 1 with the sheet removed.

Fig. 5 is a view taken looking substantially along the line 5—5 of Fig. 2.

Fig. 6 is an enlarged detailed elevational view of sheet holddown suckers constituting a part of the invention.

Fig. 7 is an enlarged view taken along line 7—7 of Fig. 3 showing adjustable means for limiting the extent to which the overguide hooks may be lowered to the operative position of Fig. 1.

Fig. 8 is an enlarged view of a connection between certain operating parts and is taken along line 8—8 of Fig. 3.

Fig. 9 is a timing diagram demonstrating the operation of the several parts as it might exist in a commercial machine.

Referring now to Fig. 1, sheets are fed from a conventional pile feeder along a feed table **10** in underlapped stream fashion. The leading edge of each sheet underlies the tail end of the previous sheet. A plurality of continuous tapes **11** pass around a tape roll **12** and drive the stream of sheets down the feed table toward registering mechanism at the forward end thereof just prior to the sheets being fed to a cylinder **13**. The cylinder may be an impression cylinder of a printing press or a feed cylinder which subsequently transfers the sheets to an impression or other cylinder. Several idler wheels (not shown) rest on top of the stream as it is fed down the table **10** and cooperate with the tapes **11** to effect frictional driving of the sheets. They feed the sheets to a feed plate **14** the top surface of which is substantially coplanar with and constitutes the forward end of the feed table **10**. The feed plate **14** is notched at certain portions as shown in Fig. 4 for purposes which will be described later. Front stops **15** located below the feed plate move from the position shown in Fig. 2 to the position shown in Fig. 1 to intercept the sheets and front register them in a well-known manner. A plurality of overguide hooks **16** have rearwardly extending overhanging portions **17** which maintain the leading edges of sheets against the feed table and prevent their passing over the tops of the front stops **15**. The front stops and hooks move to the positions of Fig. 1 prior to the time sheets arrive at the front stops. Before the sheets arrive there, they are taken by reciprocating suckers **18** (shown in detail in Fig. 6). In the preferred form of the invention, these suckers grasp each sheet in turn on its bottom side near its leading edge while the suckers are traveling at sheet speed substantially and lead the sheets beneath the overguide hooks **16**. Reciprocation of each sucker **18** is effected by an oscillating arm **19**.

After a sheet has arrived at the front stops **15** and has had sufficient time to settle against the front stops, it is gripped by a pair of side guide wheels **20** and urged against a conventional side guide abutment (not shown) to register all sheets identically along one side thereof. The mechanism for operating the side guide wheels has not been shown in detail since it is well understood by those familiar with that art. Suffice it to say that the side guide wheels **20** may comprise a fixed axis lower driven wheel and a movable upper idler wheel which together grip the sheet upon completion of front registration and frictionally drive the sheet against the side guide abutment previously referred to. Upon completion of side guiding, the sheet is pinched by feed rolls and fed by them to the cylinder **13**. The feed rolls of the present invention include a plurality of fixed axis driving rolls **21** carried on a shaft **22** located below the feed table so as to have the peripheries of the rolls **21** approximately coinciding with the surface of the feed plate **14**. To minimize the distance of feeding from the rolls to the cylinder **13**, the rolls **21** are located as close to the cylinder **13** as is physically possible without interference of parts. A plurality of upper movable feed rolls **23** cooperate with the lower rolls **21** to assist in gripping and forwarding the sheets one by one to the cylinder **13**. The upper rolls **23** are idler feed rolls carried on arms **24** mounted on an oscillating shaft **25** which is operated at the proper times by a cam (not shown) on a cam shaft **26**.

The sequence of feeding sheets may be shown by comparing the positions of the sheets in Figs. 1, 2 and 3. In Fig. 1 a first sheet S^1 is held in the grippers of the cylinder and its tail end is being removed from the feed table. The tail of sheet S^1 is located slightly to the rear of the side guide wheels **20** at the time a second sheet S^2 arrives at the front stops **15**. In practice, the overguide hooks **16** move vertically and lift the tail of sheet S^1 so as to scrape the sheet S^2 therefrom if there is any tendency of sheet S^2 to cling to sheet S^1 and want to pass

over the front stops 15. The overhanging portion 17 of each overguide hook 16 is pointed so as to provide a scraping edge for stripping S^2 from S^1. Very shortly after the tail of the sheet S^1 passes the side guide wheels 20 as shown in Fig. 1, the wheels may close and drive the sheet S^2 against the side guide abutment. The wheels 20 maintain their grip on the sheet S^2 until after the tail of the sheet S^1 has passed the transverse gripping line or point of the feed rolls 21 and 23. Any time after the tail of the sheet S^1 passes the feed rolls, the feed roll shaft 25 may be operated to bodily move the idler rolls 23 into contact with the sheet S^2 and positively grip the sheet S^2. In practice, the tail of the sheet S^1 may be a few inches past the feed rolls, but the idler rolls 23 are actually capable of moving into contact almost immediately after the tail of the sheet S^1 passes them. This is possible since the operation of the shaft 25 may occur during only one or two degrees of revolution of the cylinder 13. As a practical matter, however, it is often necessary to have a gap in a plate cylinder (not shown) of such a size sufficient to enable rapid installation and removal of the plate. Plate clamps are required to fasten the ends of the plate to the plate cylinder and these plate clamps require adequate room for ease of operation. The gap in the plate cylinder limits the amount of effective printing area and therefore requires a similar gap to be placed in the cylinder 13. The gap is shown at 27. The size of the gap, of course, determines the spacing between sheets as they pass through the press. On the particular press shown, the circumference is approximately 32", about 4" of which includes the gap. The particular feed roll mechanism of my invention will enable this gap to be reduced another inch or so because of the rapidity with which the rolls 23 can be operated upon passing the tail of the sheet S^1 and the closeness with which sheet S^2 may be fed behind sheet S^1.

Now, as soon as the rolls 23 grip sheet S^2, the side guide wheels 20 may release their grip. At this time the driving rolls 21 are stationary. The front stops 15 and the hooks 16 are then dropped to the positions shown in Fig. 2 after which time the driving feed rolls 21 may start driving the sheet S^2 toward the cylinder 13. At this particular time grippers 28 carried in the gap 27 of the cylinder are open and are moving into their sheet receiving position shown in Fig. 3. Gauge pins 29 are positioned across the cylinder 13 and are offset laterally from the grippers 28. The sheet S^2 is driven forward by the driving feed rolls 21 and the now-lowered idler rolls 23. The sheet is fed at a slightly faster rate than the speed of the cylinder 13 until the sheet S^2 hits the gauge pins 29, is crowded against them to give a second front registration of the sheet against the gauge pins, and is then taken by the cylinder upon closing of the grippers 28. As soon as the grippers 28 close, the shaft 25 is oscillated to move the idler feed rolls 23 out of contact with the sheet and discontinue their driving action in cooperation with the lower feed rolls 21. The sheet is then transferred by the cylinder 13 to subsequent cylinders of the machine.

Front stop operation

Operation of the front stops is effected as follows. The front stops 15 are carried on arms 30 mounted on a shaft 31 having a fixed axis. Each arm 30 is fastened to the shaft 31 by means of bolt 32. A lever 33 is keyed to the shaft 31 and cooperates with a cam 34 through a cam follower 35 carried on the lever 33. The lever 33 is normally urged clockwise about shaft 31 to maintain the follower 35 on its cam 34. This is accomplished by a spring 36 surrounding a rod 37 one end of which is backed by a pin 39 in a frame portion 38. The rod 37 pivots about the pin 39 while the other end passes through a hole in a noddle pin 40 pivotally carried by an extension 41 of the lever 33. The extent of movement of the follower 35 toward the cam 34 is limited by an adjustable abutment 42 which engages an abutment 43 on the extension 41. These abutments limit the uppermost position of the front stops 15. The shaft 31 is located rearwardly of the feed roll shaft 22 and the arms 30 are generally horizontal. This is desirable so that up and down movement of the front stops 15 will be substantially perpendicular to the feed plate 14 rather than parallel to it. By being perpendicularly movable, any slight misadjustment of any one of the front stop arms 30 or play in the parts due to wear will not have a tendency to move a sheet rearwardly. It will be noticed that because of the crowded condition of the parts beneath the feed plate 14, particularly the location of the shaft 22 and the lower feed rolls 21, it is necessary that the arms 30 carrying the front stops 15 extend between the feed plate 14 and the shaft 22 and also pass between adjacent driving feed rolls 21.

Overguide hook operation

Operation of the overguide hooks 16 is effected as follows. The cam 34 which operates the front stops 15 through the cam follower 35 may also and preferably does effect part of the operation of the hooks 16 by means of a link 44 connected to a pin on the lever 33. Because of the fact that the feed roll shaft 22 is very close to the cylinder 13, pivotal movement of the hooks 16 is not by itself sufficient to move the hooks between their operative and inoperative positions. A fixed axis shaft 45 carries a bracket 46 for each hook 16 and also a short lever 47. The lever 47 has a pin 48 near its end to which one end of the link 44 is connected. Now, as the lever 33 is rocked, the link 44 through the lever 47 imparts an oscillating motion to the shaft 45 and therefore pivots the overguide hooks 16 through a very small angle. Suppose the parts are at this time in the position of Fig. 1 and the hooks 16 are to be moved below the feed plate 14. This is accomplished by the cam 34 moving the follower 35 outwardly, thereby pulling rightwardly on the link 44 and pivoting the shaft 45 counterclockwise. The hooks 16 therefore will also move counterclockwise. At about the same time, the hooks 16 are given a downward movement in addition to their pivotal movement. This is permitted by the fact that each bracket 46 permits sliding of its hook 16 up and down relative to the bracket. Such sliding action is accomplished through means of a cam 49 mounted on the cam shaft 26, a cam follower 50 mounted on a lever 51 pivoted on a shaft 52, a lever 53, which urges a lever 54 carried on a shaft 55 in a clockwise direction which in turn pivots downwardly a lever 56 to the end of which is connected a link 57 pivotally fastened to a member 58 mounted on the bottom end of each of the overguide hooks 16. There is also one such lever 56 for each hook.

An eccentric adjustment 59 shown in detail in Fig. 7 provides the connection between the lever 51 and the lever 53, and a roller 60 workable in a slot 61 in the lever 53 provides the connection between the levers 53 and 54. The adjustment 59 provides for relative angular adjustment between the levers 51 and 53 by means of an eccentric shank portion 62 of a bolt 63. The purpose of such adjustment is to limit the lowermost operative position of the overhanging portions 17 of the hooks to provide for the many different thicknesses of stock handled. When the overhanging portions 17 are in such position, a few thousandths of an inch clearance is provided above the sheet, the purpose of the overhanging portions being to prevent curling or distortion of the leading edges of the sheets while they are being front registered. All of the parts previously mentioned for operating the front stops and the overguide hooks are shown in their operative positions in Fig. 1 and their inoperative positions in Fig. 3. Spring 64, rod 65, noddle pin 66 and pivot pin 67 perform substantially the same as the corresponding parts holding the follower 35 against the cam 34.

Sucker operation

Referring to Figs. 2, 5 and 6, operation of the suckers and communication of vacuum thereto is achieved as follows: A pipe **68** extends transversely below the feed plate just forward of the side guide wheels **20**. The pipe extends across the width of the press and transmits vacuum to a plurality of the suckers **18**. Vacuum comes from a pump by way of a flexible hose **69** controlled by a valve to be described shortly. The suckers themselves are reciprocated from a rearward position shown in Fig. 2, to a forward position shown in Fig. 1. Such reciprocation is along tubular slides **70** shown in detail in Fig. 6. These slides comprise a portion of a valve means directly at the suckers themselves. In operation, when the suckers are in their rearward or Fig. 2 position, vacuum is communicated to the pipes **68** and to the opening **71** of each slide **70**. A cross opening **72** communicates at specified times with an annular recess **73** connected to the sucker mouth by means of holes **74** and **75**. In the rearward position, the annular recess **73** is behind the opening **72** so that vacuum in the opening **71** is not transmitted thereto at that time. Upon forward reciprocation of the suckers **18** through means of the arms **19**, the recesses **73** coincide with the openings **72** and vacuum is communicated instantaneously to each of the sucker mouths. In the preferred form of the invention, the suckers are reciprocating forward at sheet speed at the time they take a sheet. The suckers grasp the sheet slightly to the rear of its leading edge.

As will be seen in Fig. 4, the reciprocating suckers **18** lead directly beneath the overhanging portions **17** of the hooks. They are aligned in a direction of sheet feed with the overguide hooks for best results. Once they reach their foremost position as shown in Figs. 1 and 6, the recesses **73** are beyond the cross openings **71** and now communicate with ports **76** connected to atmosphere. Therefore the suction mouths break their hold on the underside of the sheet after they are under their respective hooks. If perchance one or more of the suckers **18** do not grip the sheet because of curling of the stock or some other reason, the scraping edges of the overhanging portions **17** of the hooks **16** will perform their action to strip the sheet from tending to adhere to the bottom side of the outgoing sheet partially on the cylinder **13**.

While the suckers **18** are in their forward position and before they are retracted rearwardly, vacuum to the pipe **68** is disconnected so that the suckers **18** may travel back without disturbing the sheet. Even though the valve formed by the opening **72** and recess **73** are again opened on this return stroke, the fact that no vacuum exists in the openings **71** may again come on but at that time the underside of the sheet on the reverse stroke. Once the suckers **18** are in their rearward position, the vacuum in the opening **71** may again come on but at that time it is not comunicated to the holes **74** and **75** due to the fact that the cross-openings **71** and the recess **73** do not coincide until the arms **19** again start the forward reciprocation of the suckers. Operation of the arms **19** is effected through cam **77**, cam follower **78**, spring **79** and levers **80** and **81**. The two latter levers are fixed to a shaft **82** to which the arms **19** are also fastened. Since the arms **19** are pivotal and the suckers **18** move in a straight line, the connection between each pair is a pin and slot similar to that described between the levers **53** and **54** for effecting the up and down movement of the overguide hooks **16**.

Vacuum to the hose **69** comes from a main line **83** from the pump. A valve **84** is shown in Figs. 2 and 5 and comprises a lever **86** which turns a rotor **87** in response to action of a lever **88** due to rotation of the cam **77** which effects reciprocation of the suckers **18**. Lever **88** is carried on a pivot **89** and has its other end carrying a cam follower **90** cooperating with the cam **77** and a spring **91** maintaining the follower **90** against the cam. As the lever **86** carrying the rotor **87** is turned, a hole **92** either connects or disconnects the hose **69** with the line **83**. As previously described, it connects the hoses prior to forward movement of the reciprocating suckers **18** and disconnects them prior to the return stroke. If desired, the valve **84** can be dispensed with and vacuum continuously communicated to the slides **70**. This however might require that the pipe **68** pivot to permit the suckers **18** to be dropped below the level of the feed plate **14** on the return stroke, or that some form of valve means close off the cross openings **72** when the suckers reach their forward end of the stroke and open them again at the rearward end of their stroke.

Timing

A timing chart is shown in Fig. 9 to illustrate the relative conditions existing at specified times during the cycle of feeding each sheet. The chart commences at 0°, this being the position shown in Fig. 2 where the feed rolls are just about to start a sheet forward. It will be noticed that at that time the hooks are down, the vacuum in the suckers **18** is off, the suckers are on their way back, the side guide wheels **20** have released the sheet, the front stops **15** are below the feed plate **14**, and the upper feed rolls are closed on the sheet. By following the timing lines to the right across the chart for each of the parts, the sequence of operation of the various parts can be studied. The chart represents 360° or one complete cycle or cylinder revolution of the press. Since such operation has already been described to a large extent, only certain portions will be re-described as they relate to the chart. It will be noted that at approximately 268° on the chart, the tail of a sheet held by the cylinder **13** has just cleared the side guide wheels **20**. Two degrees thereafter, the side guide wheels may close on the underlying sheet and commence side guiding it. Then, at approximately 325° the tail of the outgoing sheet clears the feed rolls. The feed rolls are shown as closing approximately 5° later. As mentioned previously, this may occur in just one or two degrees because of the particular arrangement of the feed rolls combined with the underneath registering mechanism. The only operation required for closing the feed rolls is the oscillation of the shaft **25** which can occur very rapidly. The side guide wheels **20** can move up at approximately 335°. Any time after the side guides have released the sheet, and as soon as the front stops **15** and the hooks **16** are moved to their inoperative positions, the feed rolls can commence feeding the sheet. As shown on this particular chart, about 25° is permitted for the operation of the front stops, hooks and side guides to their inoperative positions. As I have mentioned earlier, some of this time can be dispensed with if desired, since I can operate the hooks and stops much faster than described. However, because of gap size limitations, I use all the time I have available and operate them more slowly.

By utilization of the known principle of underneath registration of sheets, in combination with feed roll sheet feeding mechanism, I can feed sheets in closer succession than heretofore possible. Under registration permits me to start my front registration at any time within the limits of the speed of the sheets down the feed table by the tapes **11**. Commencement of the side registration can occur immediately after the tail of an outgoing sheet passes the side guiding wheels if desired. If the time it takes the tail of the sheet to move from the side guide wheels **20** to a point past the gripping line of the feed rolls **21** and **23** is sufficient for side guiding, I can grip the registered sheet almost immediately upon passage of the tail past the feed rolls. The only limitations on how fast I can feed the next sheet, or how close I can feed it to the previous one is determined by the time it takes to release with the side guide wheels **20** and move the front stops **16** and hooks down.

While the preferred embodiment of the present invention has been described in considerable detail, further modifications, constructions and arrangements will be apparent to those skilled in the art and it is hereby my intention to cover all such modifications, constructions and arrangements which fall within the spirit and scope of the present invention.

Having described my invention, I claim:

1. Mechanism for registering and feeding underlapped sheets to grippers of a sheet handling cylinder, comprising in combination, a substantially horizontal feed table having a forward end closely approaching the top side of the cylinder at an angle to cause the cylinder to lift a sheet from the table when taken by its grippers, a plurality of feed rolls on a fixed axis transverse to the direction of sheet feed and below the feed table near its leading edge, said feed rolls having their peripheries approximately coinciding with the upper surface of the feed table, a plurality of feed rolls above the feed table cooperating at pre-selected times with the lower feed rolls to grip and feed each sheet in turn to the cylinder, means for bodily moving said upper feed rolls from an upper position in which they are out of engagement with sheets to a lower position in which they cooperate with the lower feed rolls, underneath front stops forward of the feed rolls, means operating said stops from a lower position below the feed table to an upper position in which they intercept and front register each sheet as it rests on the feed table, side guide means located rearwardly of said feed rolls and operable to grip and side register each sheet after it has been front registered, and conveyor means presenting each underlapped sheet in turn to said front stops while the tail of the previous sheet held by the grippers on the cylinder is to the rear of the side guide means, said side guide means being operable to side register a sheet which is against the front stops after the tail of the outgoing sheet passes the side guide means, and said upper feed roll moving means being actuated to cause the feed rolls to grip a sheet after the tail of the outgoing sheet passes the feed rolls, thereby permitting the front stops and side guide means to release the sheet and enable it to be fed to the grippers on the cylinder when the grippers are next in sheet-receiving position.

2. Mechanism according to claim 1 including overguide hook means having an inoperative position below the feed table near its leading edge and an operative position above the sheet path in which latter position said hook means catches the leading edge of each sheet and holds it against the table while it is against the front stops, and means operating said hook means between their operative and inoperative positions at approximately the time the front stops are so operated.

3. Mechanism according to claim 2 including sucker means reciprocable in the direction of sheet feed from a position to the rear of the hooks when the hooks are in operative position to a second position in which they are beneath the hooks, said suckers having suction mouths operating in the plane of said table, means for reciprocating said suckers, and means for communicating vacuum to said suckers comprising first valve means operated once for each sheet fed for communicating vacuum to the sucker prior to commencement of its forward travel and discontinuing vacuum thereto near the end of its travel, and second valve means operable in response to forward motion of said sucker after it has reached the speed of the sheet.

4. Mechanism according to claim 3 in which said second valve means comprises a stationary slide for sucker reciprocation, said slide being located closely adjacent and parallel to the bottom of the table and having vacuum communicating thereto through said first valve means prior to and during the forward travel of said sucker.

5. In registering mechanism for a sheet fed printing press including a cylinder having sheet grippers, a feed table along which sheets are fed in underlapped stream

fashion, a plurality of overguide hooks for catching and leading sheets to a front registering point and holding them against the feed table while the tail of an outgoing sheet is being withdrawn from the feed table, a plurality of reciprocating suckers operative from a position to the rear of the hooks when they are in operative position to a second position in which they are forward of rearward extensions of the hooks, said suckers having suction mouths operating in the plane of said table and being aligned in the direction of sheet feed with said hooks, means for reciprocating said suckers, and means for communicating vacuum to said suckers comprising first valve means operated once for each sheet fed for communicating vacuum to each sucker prior to commencement of its forward travel and discontinuing vacuum thereto near the end of its travel, and second valve means operable in response to forward motion of said sucker after it has reached the speed of the sheet.

6. Mechanism according to claim 5 in which said second valve means comprises a stationary slide for sucker reciprocation, said slide being located closely adjacent and parallel to the bottom of the table and having vacuum communicating thereto through said first valve means prior to and during the forward travel of said suckers.

7. In registering mechanism for a sheet fed printing press including a cylinder having sheet grippers, a feed table along which sheets are fed in underlapped stream fashion, underneath front stops along the leading edge of the feed table, a plurality of overguide hooks for catching and leading sheets to the front stops and holding them against the feed table while the tail of an outgoing sheet is being withdrawn from the feed table, means for pivoting said front stops and hooks through small angles from inoperative positions below the table to operative positions above the sheet path, means for moving said hooks outwardly and inwardly with respect to its pivot in addition to the pivotal movement, and means for adjusting said hook moving means whereby the distance of the hooks above the feed table when they are in operative position may be varied to compensate for different stock thicknesses.

8. Mechanism for registering and feeding underlapped sheets to grippers of a printing press cylinder, comprising in combination, a feed table having a forward end closely approaching the cylinder's surface, a transverse rotatable feed roll shaft below the table at the forward end of the table, the shaft being on a fixed axis and carrying spaced driven feed rolls having their peripheries approximately coinciding with the surface of the table, spaced idler feed rolls above the table movable toward and away from the driven feed rolls and cooperating therewith to grip and forward sheets to the grippers on the cylinder, front stops below the table and forward of the axes of the feed rolls, said front stops being carried on arms extending between the adjacent lower feed rolls and between their axis and the feed table, means below the table located rearwardly of the lower feed rolls operating the front stops up and down into and out of the path of sheet travel, a plurality of hooks extendible over the forward edges of sheets at the front stops and movable forwardly and downwardly to clear the sheet path, said hooks having arms extending between the lower feed rolls and forward of their axis, operating means for said hooks comprising mechanism located below the lower feed rolls, reciprocating sucker means having vacuum communicated thereto for taking the forward ends of sheets and leading them beneath the hooks as the suckers approach the front stops, said sucker means having their gripping surfaces generally in the plane of the top surface of the feed table and being aligned in the direction of sheet feed with said hooks, and means located rearwardly of the lower feed rolls for reciprocating the sucker means in the direction of sheet feed and back.

9. The method of registering and feeding sheets to a

sheet handling cylinder, comprising the steps of feeding sheets in underlapped stream fashion along a feed table approaching the cylinder's surface, intercepting and front registering the first sheet of said stream from below at the forward end of said feed table, side registering said sheet at a point to the rear of the front registering point, gripping the sheet from above and below at a point to the rear of the front registering point, discontinuing front and side registration of the sheet, advancing the leading edge of the second sheet in the stream past said side registering point soon after side registration of the first sheet is discontinued, forwarding the gripped first sheet to said cylinder, releasing the grip after the first sheet is taken by the cylinder and before the advancing second sheet reaches the gripping point, intercepting and front registering the second sheet from below while the tail of the out-going first sheet is rearwardly of the side registering point, side registering the second sheet soon after the tail of the outgoing sheet passes said side registering point, gripping the second sheet from above and below soon after the tail of the first sheet passes said

gripping point, and thereafter forwarding the second sheet to said cylinder in like manner to the first in closely spaced relation to the tail of the first sheet.

10. The method according to claim 9 wherein the gripping is accomplished by bodily moving roller means from above the sheet path into engagement with each sheet in turn.

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