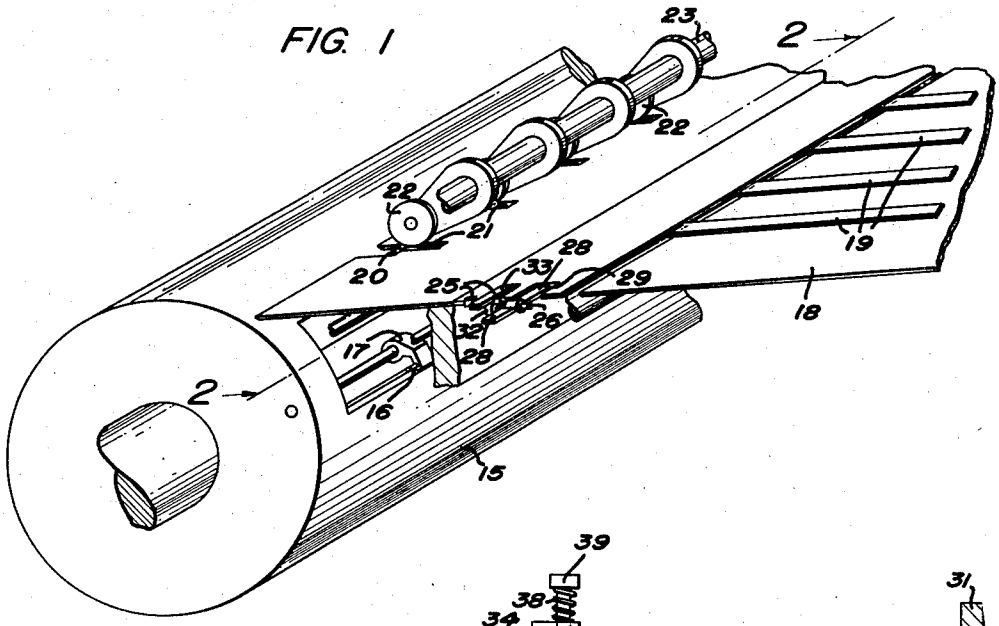
Oct. 21, 1958 K. E. KIST 2,857,161

SHEET FEEDER

Filed Aug. 16, 1956 5 Sheets-Sheet 1

FIG. 1



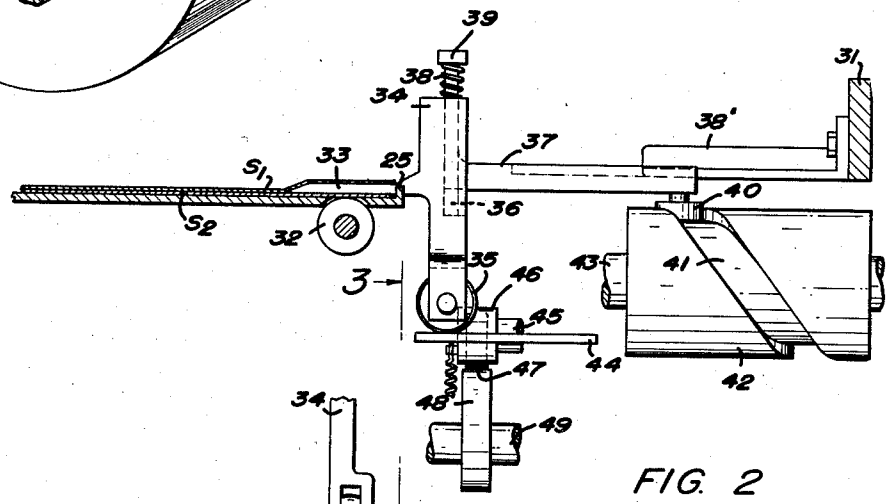


FIG. 2

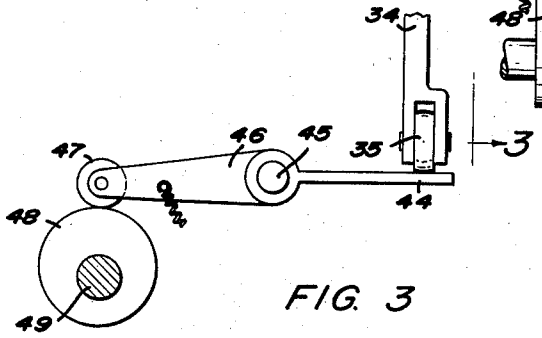


FIG. 3

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Oct. 21, 1958 K. E. KIST 2,857,161

SHEET FEEDER

Filed Aug. 16, 1956 5 Sheets-Sheet 2

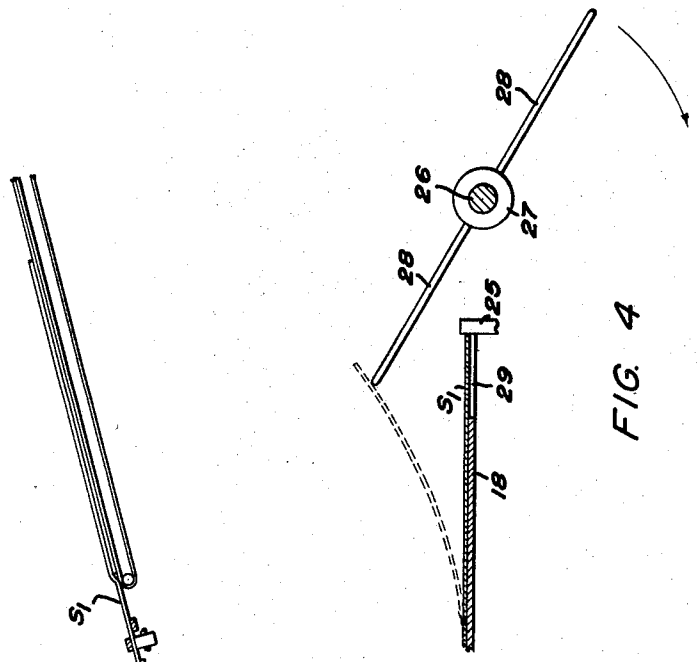


FIG. 4

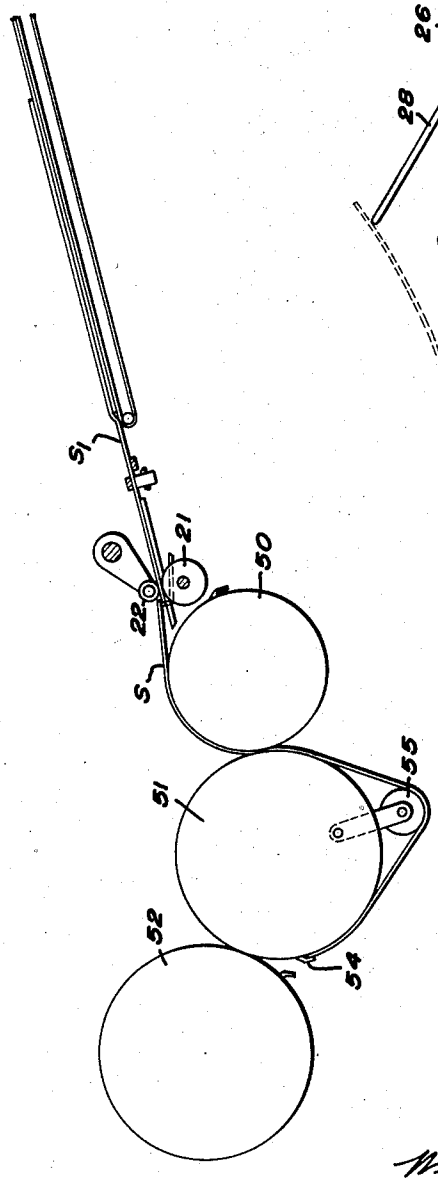


FIG. 9

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SHEET FEEDER

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FIG. 5

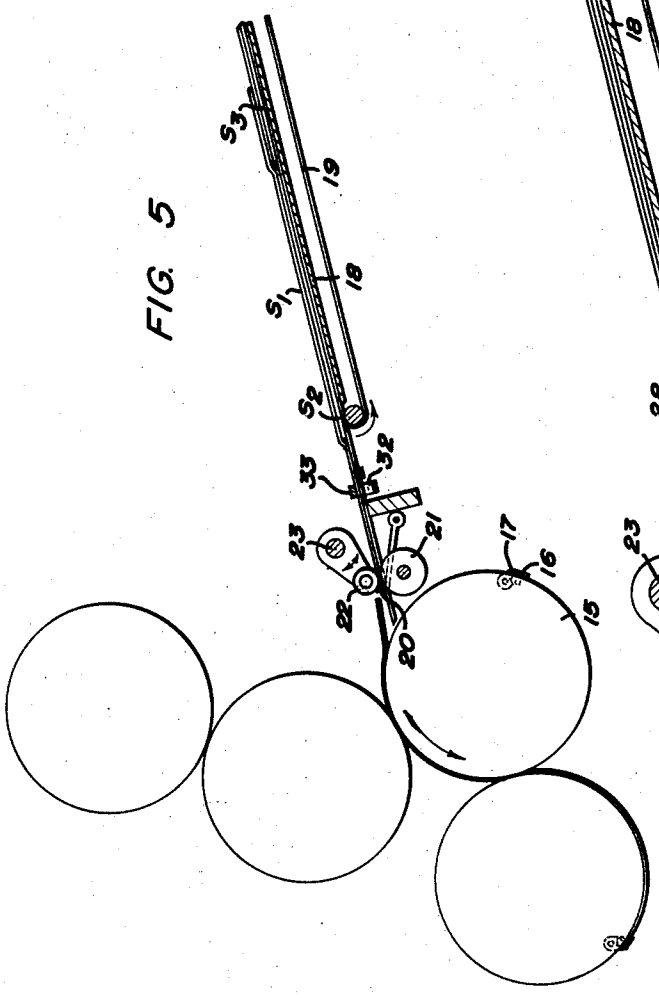
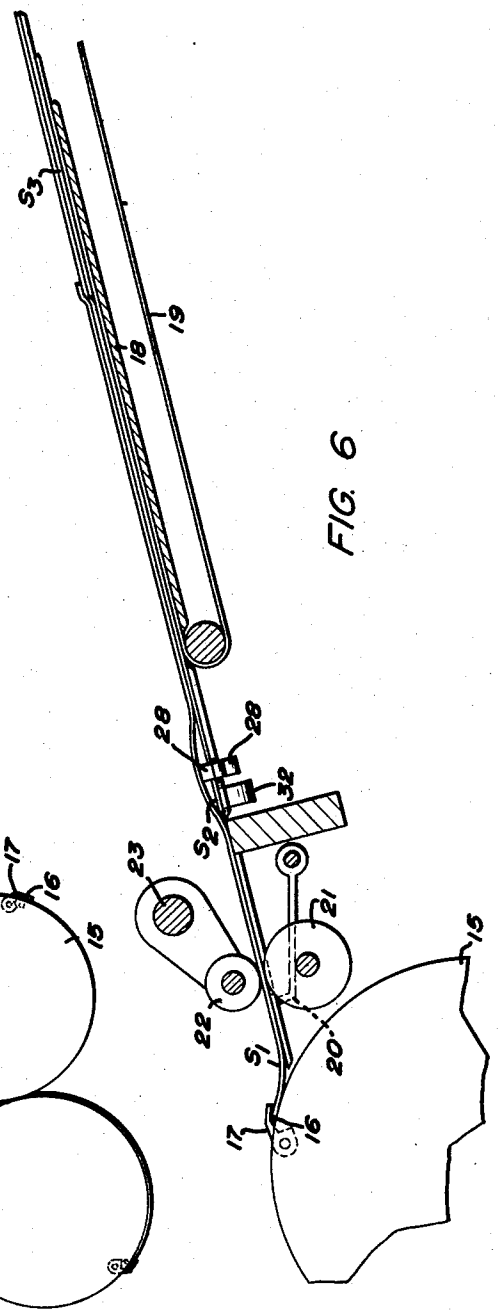


FIG. 6



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SHEET FEEDER

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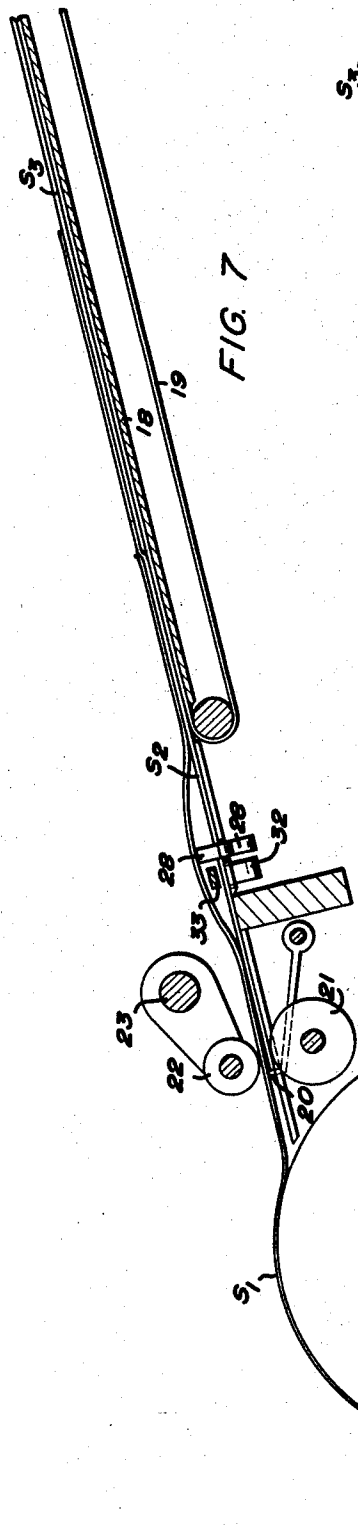


FIG. 7

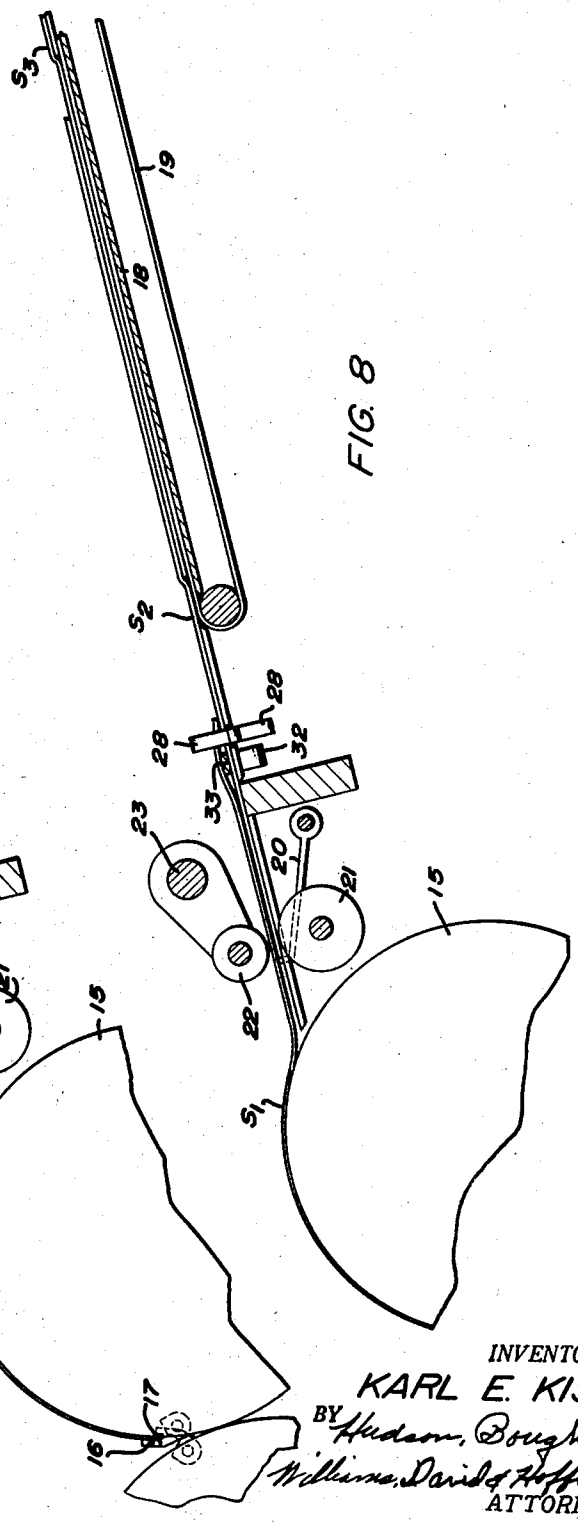


FIG. 8

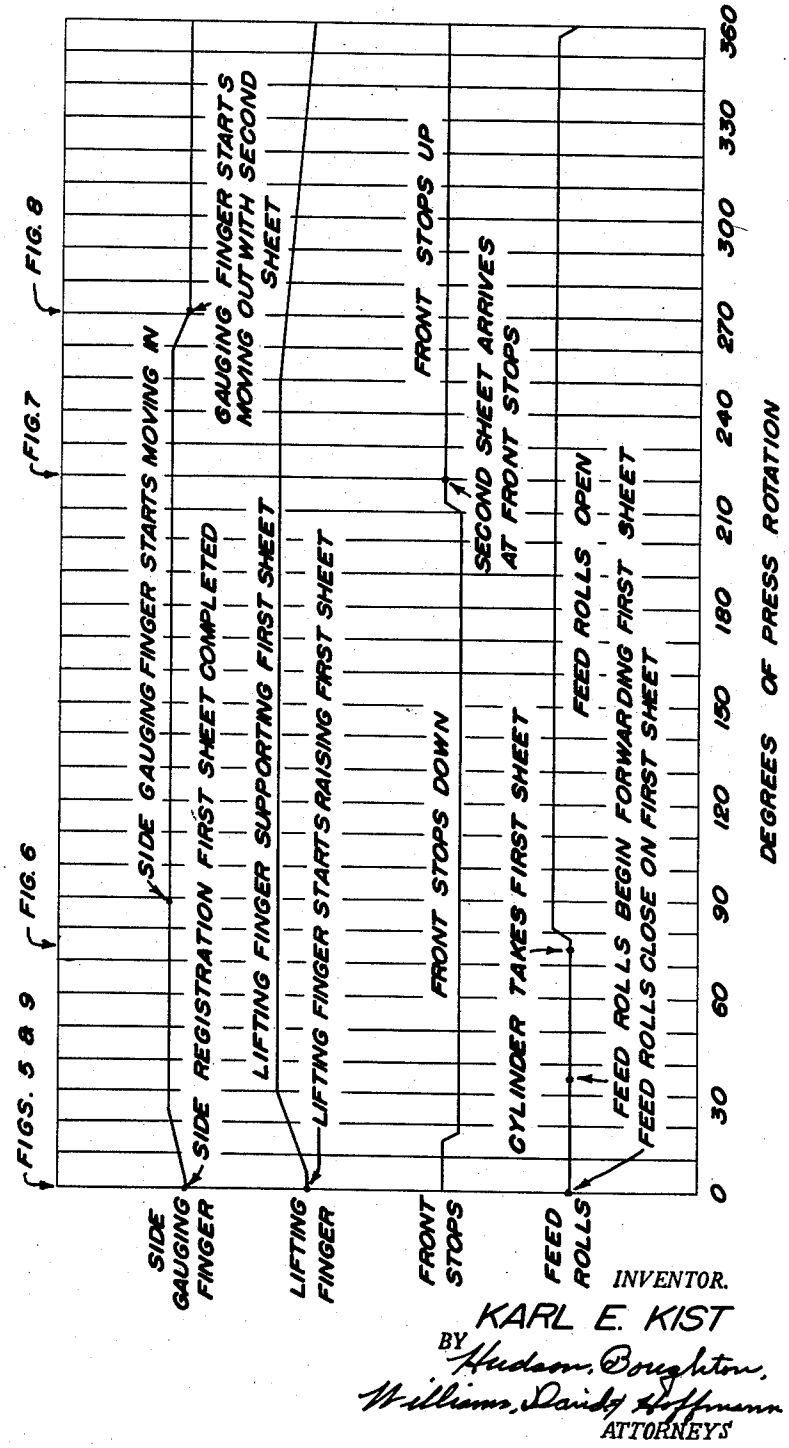
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SHEET FEEDER

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FIG. 10



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United States Patent Office 2,857,161 Patented Oct. 21, 1958

2,857,161

SHEET FEEDER

Karl E. Kist, Cleveland, Ohio, assignor to Harris-Intertype Corporation, a corporation of Delaware

Application August 16, 1956, Serial No. 604,446

10 Claims. (Cl. 271—48)

This invention relates to improvements in sheet feeders, the purpose being primarily to permit commencement of side registration of each sheet earlier than heretofore possible to thereby allow more time for registration or allow advantage to be taken of this fact in any one or a combination of ways well known in the art.

The apparatus and method of this application are related to the invention of Jack E. Vandeman, Serial No. 604,445, filed of even date herewith.

One of the objects of the invention is to provide a method of and means for effecting early commencement of side registration of an underlapped sheet while the tail of a sheet being fed to the sheet handling machine overlies the sheet being registered, the means and method being divided into separate elements and motions to permit ease of operation and simplicity of operating parts.

Another object is to provide means for carrying out the method smoothly and efficiently without necessitating the use of rapidly operating parts.

Another object is the provision of means for withdrawing rapidly the rear end of a sheet taken by a printing machine to carry it clear of the feed rolls so that the position of the tail end of a sheet relative to the rolls is not a limiting factor on the time when registration can be completed, and to permit early gripping of the next sheet by the feed rolls.

Another object is to permit feeding of sheets of greater length with the same size cylinders, to permit lower tape speeds in carrying sheets to the front stops and to permit more leeway in selecting the distance that the side registering mechanism lies to the rear of the feed rolls.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Fig. 1 is a fragmental perspective view of apparatus embodying the invention;

Fig. 2 is a diagrammatic view partially in transverse vertical section of a feed board equipped with a gauging finger forming a part of a side registering mechanism;

Fig. 3 is an elevational view taken substantially on the line 3—3 of Fig. 2 illustrating a means for raising and lowering the gauging finger at the ends of the back and forth travel thereof;

Fig. 4 is a diagrammatic detail view of a lifting finger employed for carrying out the invention;

Fig. 5 is a diagrammatic view of a feeder wherein one sheet has been taken by the cylinders of a printing press and another sheet, hereinafter referred to as the first sheet of the stream, has just been side registered and gripped by pairs of feed rolls;

Fig. 6 is a similar view on a somewhat larger scale showing the first sheet at the point of being taken by the sheet handling machine, and the second sheet of the stream just passing the side registration point, the tail of the first sheet having been lifted prior to such passing;

Fig. 7 is a similar view showing the second sheet being front registered, with the gauging finger having been inserted between the lifted first sheet and the second sheet;

Fig. 8 is a similar view showing the second sheet being side registered;

Fig. 9 is a similar view of a modification which includes an advancing cylinder having a pull-out roll for causing the rear end of the first sheet to move more rapidly than its front end to clear the feed rolls earlier in the cycle so that they may take the second sheet correspondingly early, and

Fig. 10 is a timing diagram.

In Fig. 1 a cylinder of a printing press is shown at **15**. It may be the impression cylinder or it may be an auxiliary feeding cylinder. On it are plurality of front gauging pins **16** and a series of sheet grippers **17**. The feed board **18** of a sheet feeder provided with forwarding tapes **19** carries a stream of underlapped sheets forward toward the press or other sheet handling machine at a relatively low speed compared with that of the machine to which the sheets are being fed. A series of front stops **20** are adapted to be projected upwardly through slots in the feed board for front registering the sheets.

After the front and side registering operations on a sheet are completed and the preceding sheet has progressed into the machine, feed rolls of conventional character grip the sheet and push it forward against the gauge pins **16** on the cylinder **15**. These feed rolls may embody lower rolls **21** rotating on a fixed axis and drop rolls **22** which swing up and down around an axis **23**. One or the other of the rolls of each pair is positively driven, the other roll being an idler roll.

The fixed side gauge of the feed board is illustrated at **25**. It is located at a substantial distance behind the front stops **20** adjacent the side registering mechanism about to be described. In accordance with the invention means is provided for lifting a side edge portion of what may be termed the first sheet S^1 of the stream. This lifting means is located adjacent the side registering means and close to the side gauge. Such a lifting means is illustrated in Figs. 1 and 4. It comprises a shaft **26** which is parallel to the lengthwise dimension of the feed board and is mounted in bearings carried by the frame. Rotatable with the shaft **26** there is a hub **27** carrying a plurality of radial fingers **28**, shown herein as two in number. The hub **27** as shown turns through an angle of 180° for each press revolution. As shown in Fig. 4 one of the fingers **28** is in a position of rest which is maintained for a considerable part of each cycle. When a sheet has been grasped by the side gauging finger and is about to move out to draw the sheet into side gauging position, hub **26** starts a rapid clockwise rotation which quickly brings the other finger **28** up through a slot **29** in the feed board, lifting the side edge portion of sheet S^1 to the dotted line position of Fig. 4. This movement lifts the side registered sheet shortly after it has been gripped by the feed rolls and maintains the moving sheet in the dotted line position, permitting a second sheet to advance therebeneath. Then while the finger **28** holds up the side edge of the first sheet the gauging finger may move inwardly, grasp the second sheet and draw that sheet outwardly to side gauging position. The movement of shaft **26** from the illustrated position to a position 180° therefrom may be effected smoothly by a Geneva mechanism, not shown, having an extended stop period and relatively short periods of acceleration, constant speed and deceleration back to the stop period. However other indexing means may be employed to provide a 180° revolution of shaft **26** between periods of dwell.

The side registering mechanism is preferably one which grasps the sheet from above and below. It may comprise an idler roller **32** mounted on fixed bearings and projecting through the slot **29** in the feed board

with its upper surface approximately level with the upper surface of the feed board. The registering mechanism also comprises a gauging finger 33 mounted to move inwardly above the roller 32, downwardly to press a sheet S^2 against the roller and outwardly to draw the sheet against the side gauge 25. The finger 33 is integral with a vertical post 34 having a caster 35 on its lower extremity. In the vertical post 34 there is a vertical dovetail groove 36 in which one arm of an L-shaped bar 37 is slidable. The upper end of this bar is surrounded by a coil spring 38 which bears against a head 39 on the bar tending to depress the post 34 relative to the bar. The horizontal arm of bar 37 is grooved to take a guide bar 38' of inverted T-shape which projects inwardly from a frame member 31. The horizontal arm of bar 37 carries a roller follower 40 which runs in a cam groove 41 of a barrel cam 42 mounted to turn with a shaft 43 which is driven in one to one ratio with the press or other sheet handling machine.

Caster 35 runs upon a plate 44 which is mounted to swing upon a pivot 45 fixed in the frame. Integral with plate 44 there is an operating arm 46 which moves plate 44 up and down by means of a follower 47 running upon a cam 48 which turns with a shaft 49 that is likewise driven in one to one ratio with the sheet handling machine.

The parts are so designed and proportioned that while the finger 33 is moved inwardly over the feed board, the edge of sheet S^1 is being then lifted by finger 28, the plate 44 will be raised somewhat. When the finger reaches its innermost position the next sheet S^2 will have advanced along the feed board into position beneath the finger. Upon completion of front registration of sheet S^2 against front stops 20, the plate 44 will descend and the spring 38 will depress finger 33 to pinch the sheet S^2 against the roller 32. Next the cam 42 will pull the finger outward drawing the sheet S^2 against the side gauge 25 to side register the latter sheet.

In Fig. 5 the first sheet of the stream has been front and side registered and bears against the front stops 20. The feed rolls 21, 22 will now be brought together to grip the forward portion of the sheet momentarily. The front stops 20 then drop out of the way to permit the feed rolls to push the sheet forward against the gauge pins 16 where it is gripped by the sheet grippers 17 and carried forward rapidly by the press as indicated in Fig. 6 of the drawing, at which point the feed rolls 21, 22 will open.

As soon as the feed rolls close, the lifting finger 28 starts to raise the edge portion of sheet S^1. Front stops 20 now rise beneath sheet S^1, and the gauging finger 33 moves in between the sheets without contacting either of them. The movement of the stream continues with the sheet S^1 lifted until sheet S^2 engages the front stops 20 and is front registered. Finger 33 now descends and pinches the sheet S^2 against roller 32 after which the finger moves outwardly to side register that sheet. The lifting finger 28 may be moved out of the way at any time after the gauging finger is in position between the sheets. The feed rolls 21, 22 can now drop to grip the sheet S^2 as soon as the tail of sheet S^1 has passed the rolls. Sheet S^2 may now be forwarded to the press.

The travel of the rear edge of sheet S^1 from the position of Fig. 8 through the separated feed rolls 21, 22 may be hastened by the modified arrangement of Fig. 9 where the feed board 18 leads the sheets to a feed cylinder 50. This cylinder is driven at a non-uniform speed with two different constant speed periods and two periods of acceleration and deceleration, as by mechanism disclosed in Wood application Serial No. 313,722, filed October 8, 1952. Each sheet after being registered is gripped by the feed rolls 21, 22 and driven forward against the gauge pins of the cylinder 50 at a speed somewhat greater than the speed of that cylinder during its acceleration period. Thereafter the drive to cylinder 50 reaches its higher constant speed period which gives it a surface speed equal to the surface speed of cylinder 51 which rotates at the same speed as that of the printing machine cylinders, at which speed the forward edge of the sheet is taken by grippers 54 on cylinder 51 and moved forward for transfer to impression cylinder 52.

In this form of the invention after a sheet is taken by the grippers 54 on cylinder 51 at the time the grippers 54 pass the line of centers between cylinders 50 and 51, a pull-out roll 55 begins to move outwardly, advancing the rear edge of the sheet more rapidly than the front edge. Consequently, the rear edge of the sheet reaches the position shown in Fig. 9 at the same time that it would be somewhere to the rear of the feed rolls in the prior described modification. Means for operating a pull-out roll of the type illustrated is disclosed in Wood Patent 2,571,806.

This sheet, which may be considered as a sheet in advance of the stream on the feeder, and which is marked S in Fig. 9, therefore clears the feed rolls 21, 22 earlier in the cycle, and the next sheet S^1 may be taken by the feed rolls at a correspondingly earlier point in the cycle. Hence the earlier closing of the feed rolls, which occurs right after completion of side registration, permits earlier ending of registration and consequently also earlier starting of registration.

The timing of the gauging finger, lifting finger, front stops and feed rolls is shown in Fig. 10, it being understood that the timing may be somewhat different for the Fig. 9 modification than that shown in Figs. 1 to 8. Preferably, the Fig. 9 modification will be taken advantage of by feeding sheets of greater length than those used in the first described structure. If this is done, the timing of the two may be nearly identical.

Having thus described the invention, I claim:

1. Sheet feeding mechanism for a printing press or other sheet handling machine comprising means for feeding sheets is underlapped stream formation, front registering means adapted to register a sheet while a preceding sheet overlies it, side registering mechanism disposed behind said front registering means, a side gauge, said side registering mechanism comprising upper and lower members adapted to grasp a sheet from above and below, means for lifting one edge of the moving first sheet of the stream at a point near said side registering mechanism, means for causing said upper member to enter the space beneath the lifted portion of the first sheet while leaving the second sheet free to advance, means for commencing operation of said side registering mechanism to draw said second sheet against said side gauge after the second sheet has been front registered, but before the rear edge of the first sheet passes said side registering mechanism, and means for feeding said second sheet to the sheet handling machine after said first sheet has completely passed said front registering means.

2. Sheet feeding mechanism for a printing press comprising means for feeding sheets in underlapped stream formation, front registering means adapted to register a sheet while a preceding sheet overlies it, side registering mechanism disposed behind said front registering means, means for gripping and advancing a registered sheet into the press, a side gauge, a lifting finger, means for projecting said lifting finger beneath one edge of the moving first sheet of the stream adjacent said side registering means and raising said finger to lift that edge of the sheet, said side registering mechanism comprising a gauging finger, and means for inserting the gauging finger into the space provided beneath the lifted portion of said first sheet, causing said gauging finger to contact and grip the second sheet of the stream and draw that sheet against said side gauge for commencing side registration of the

second sheet while the first sheet overlies the second sheet at the side gauging point.

3. A sheet feeder as defined in claim 2, comprising means for accelerating the movement of the rear edge of the first sheet until it passes said gripping and advancing means, said gauging finger holding the registered second sheet until taken by said gripping and advancing means, and releasing it immediately thereafter, whereby the next following sheet may travel past the side gauging point toward the front registering means.

4. Sheet forwarding mechanism for a printing press comprising means for feeding sheets in underlapped stream formation, front registering means adapted to register a sheet while a preceding sheet overlies it, feed rolls rearward of said front registering means for gripping and advancing each sheet into said press, side registering mechanism disposed behind said front registering means adapted to operate on a sheet from above and below, a side gauge, means for lifting one edge of the moving first sheet of the stream at a point adjacent said side registering mechanism after the first sheet of the stream is taken by said feed rolls, means for operating said side registering mechanism to project an element thereof under said first sheet and at least commence drawing said second sheet against said side gauge while the first sheet is so lifted, means for withdrawing said front registering means to permit said second sheet to be advanced, and means for accelerating the movement of the rear edge of the first sheet until it has passed said feed rolls, thereby permitting early operation of the feed rolls upon the second sheet, said side registering mechanism holding the second sheet until gripped by the feed rolls and immediately thereafter releasing it, whereby the next following sheet may travel past the side gauging point toward the front registering means.

5. Sheet feeding mechanism for a printing press or other sheet handling machine comprising means for feeding sheets in underlapped stream formation, a feed table, gripping and advancing means near the forward end of said table for feeding sheets one at a time to said sheet handling machine, underneath front registering means at the forward end of said table, side registering mechanism disposed behind said front registering means adapted to grip a sheet from above and below, a side gauge, means for lifting one edge of an outgoing sheet of the stream near a point adjacent said side registering mechanism, means operating said side registering mechanism to enter a portion thereof into the space beneath the lifted portion of the outgoing sheet without disturbing the lower foremost sheet on the table in its travel toward the front registering means, means operating said front registering means to intercept and front register the latter sheet, the means for operating the side registering means thereafter causing the side registering means to grip the front registered sheet from above and below and to pull it transverse to the direction of sheet travel through said machine to side register the sheet against the side gauge, at least the commencement of said pulling action occurring while the outgoing sheet overlies the gripped sheet, and means operating the gripping and advancing means after the outgoing sheet has passed the gripping and advancing means.

6. The invention forth in claim 5 including means for accelerating the movement of the rear edge of the outgoing sheet past the gripping and advancing means, said side registering mechanism holding the second sheet until taken by said gripping and advancing means and releasing it immediately thereafter, whereby the next following sheet may travel past the side registering mechanism toward the front registering means.

7. The method of stream feeding sheets in underlapped fashion toward a printing press or other sheet handling machine, which comprises gripping a first sheet near its leading edge and advancing it toward the sheet handling machine, front registering a second sheet underlying the first sheet against front stops raised from beneath the stream of sheets, grasping the second sheet at least from below by transversely movable means at a point to the rear of the point at which it is to be gripped for advancing, side gauging the second sheet with said transversely movable means, at least commencement of the side gauging occurring while the first sheet overlies the side registering point, accelerating the movement of the rear edge of the first sheet until it passes the point at which the sheets are gripped for advancing, gripping said second sheet, and releasing the sheet at said side registering point immediately after it has been gripped, whereby the next following sheet may travel past said side registering point toward the front stops.

8. Sheet feeding mechanism for a printing press or other sheet handling machine comprising means for feeding sheets in underlapped stream formation, underneath front registering means adapted to front register a sheet while a preceding sheet overlies it, sheet gripping and advancing means adapted to operate near the leading edge of a sheet registered against said front registering means, side registering mechanism disposed rearwardly of said sheet gripping and advancing means and adapted to operate on a sheet at least from below, a side gauge, means for moving said side registering mechanism transversely to side register a sheet against the side gauge after it has been front registered, at least the commencement of side gauging occurring while a portion of the first sheet overlies the side registering point, and means for accelerating the movement of the rear edge of the first sheet until it passes the gripping and advancing means, whereby said last named means may grip the front and side registered second sheet, thereby permitting said side registering means to release the second sheet so that the leading edge of the next following sheet may pass the side registering means on its travel toward the front stops.

9. Mechanism according to claim 8 wherein said side registering means comprises members for gripping a sheet from above and below and includes means for inserting the upper member between the outgoing first sheet and an underlying second sheet.

10. Mechanism according to claim 9, including means for lifting at least an edge portion of the first sheet to enable the upper member of the side registering means to be inserted between the first and second sheets.

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2,248,079	Harrold et al.	July 8, 1941
2,571,805	Wood	Oct. 16, 1951