March 28, 1961 J. E. VANDEMAN 2,977,115

FRONT REGISTER MECHANISM

Filed June 10, 1958 2 Sheets-Sheet 1

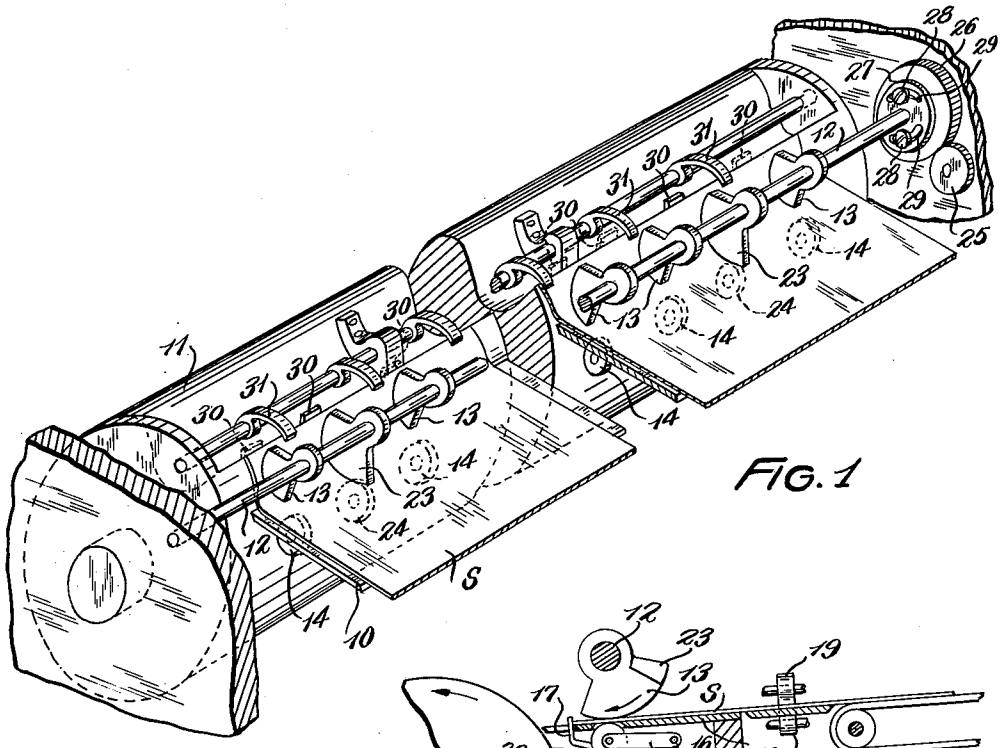


FIG. 1

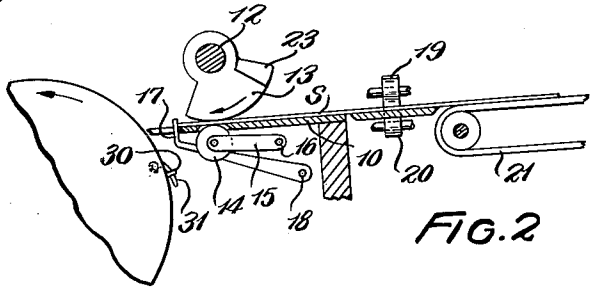


FIG. 2

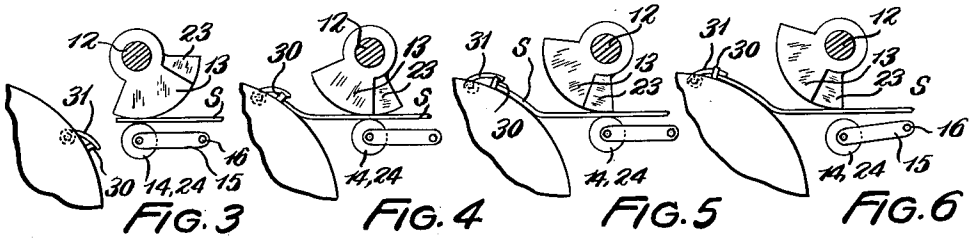


FIG. 3 FIG. 4 FIG. 5 FIG. 6

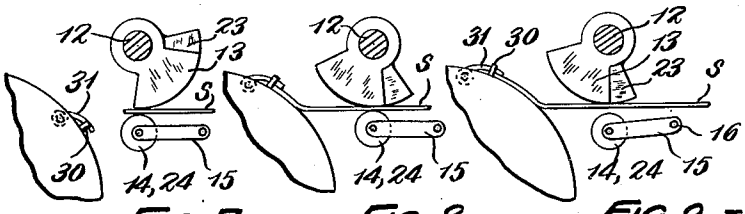


FIG. 7 FIG. 8 FIG. 9

INVENTOR.
JACK E. VANDEMAN
BY Hudson, Boughton
Williams, David & Hoffmann
ATTORNEYS

March 28, 1961 J. E. VANDEMAN 2,977,115

FRONT REGISTER MECHANISM

Filed June 10, 1958 2 Sheets-Sheet 2

FIG. 10

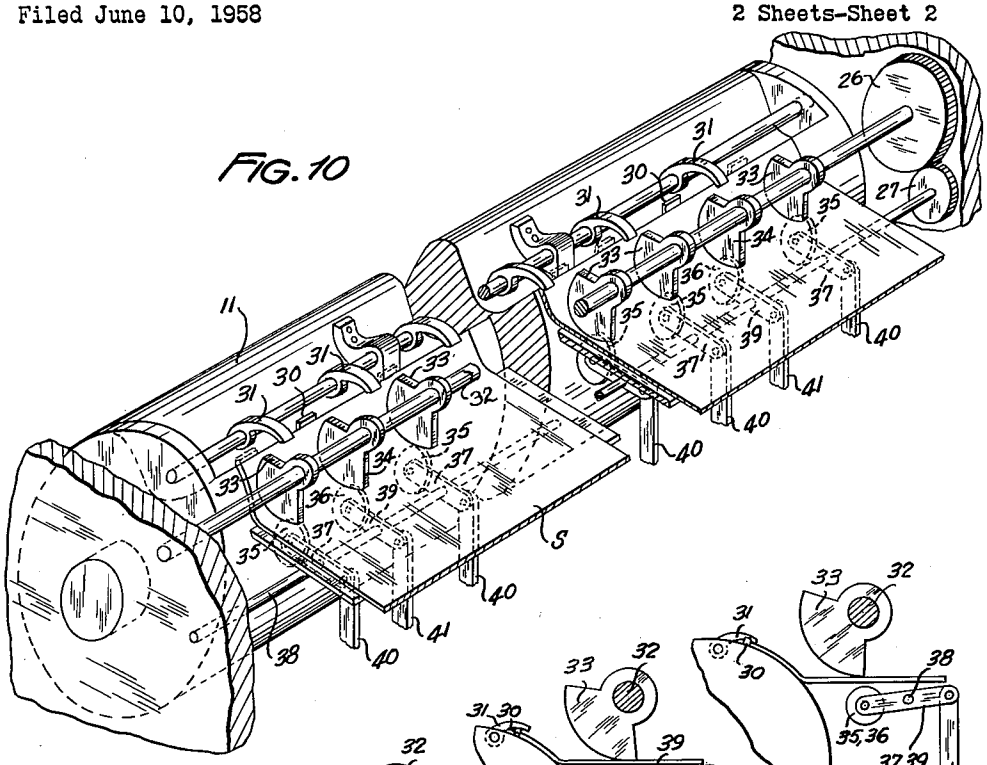


FIG. 14

FIG. 13

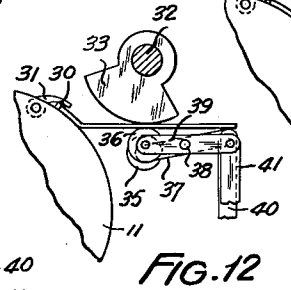


FIG. 12

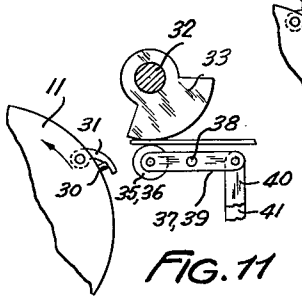


FIG. 11

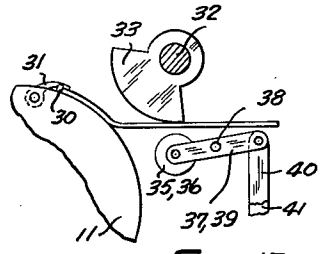


FIG. 17

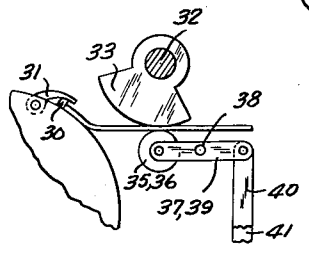


FIG. 16

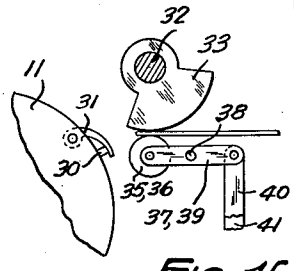


FIG. 15

INVENTOR.
JACK E. VANDEMAN
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

United States Patent Office 2,977,115 Patented Mar. 28, 1961

2,977,115

FRONT REGISTER MECHANISM

Jack E. Vandeman, Berea, Ohio, assignor to Harris-Intertype Corporation, Cleveland, Ohio, a corporation of Delaware

Filed June 10, 1958, Ser. No. 741,443

18 Claims. (Cl. 271—53)

This invention relates to improvements in front registering mechanism for sheet feeding machines, and has to do primarily with nipper or feed roll mechanism adapted to feed relatively stiff, heavy sheets such as cardboard to a sheet handling machine. This application is a continuation-in-part of my copending application Serial No. 569,830, filed March 6, 1956, now abandoned.

One of the most successful types of front registering mechanism comprises a cylinder which has several gauge pins carried thereby and several grippers for receiving a sheet and passing it to another cylinder of the machine. The means for feeding sheets against the gauge pins to apply final front registration of the sheet against the gauge pins consists of a plurality of nipper or feed rolls, certain ones of which are generally aligned with the gauge pins in the direction of sheet feed. Such a device is shown in Harris U.S. Patent 1,307,969 for example. Mechanism of this sort is capable of handling either paper or cardboard sheets provided the front edges of the sheets, especially cardboard sheets, are fairly true. Paper sheets as received from a paper mill are ordinarily accurately trimmed and thus can be fed as purchased. Cardboard sheets as usually received from the paper mill have somewhat irregular edges. This makes it difficult, when feeding the latter, to obtain accurate registration for high quality printing or subsequent registration in a cutter and creaser or other machine having front registration means not identically matching the several gauge pins. Where quality is of great importance, cardboard sheets can be used on presses having the conventional feed roll registering mechanism and several gauge pins only if the sheets are given preliminarily a rather expensive trim.

It is known that untrimmed cardboard sheets can be registered satisfactorily when only two front registering points are used. This is not true however when the two points are a pair of gauge pins on the cylinder and when numerous feed rolls are used to drive the sheet against the gauge pins and overfeed it at a speed greater than cylinder speed at the time of registration. In the latter case, those feed rolls other than the ones generally aligned with the gauge pins in the direction of sheet feed, buckle and bow the sheet about the two gauge pins, thus making it difficult for the grippers to take the sheets and also to reregister them later, since the amount of buckling or bowing may be different. Further, since the bowing may be different from one sheet to the next, the probability of misregister of the printed image with the front edge of the sheet is increased. This would result in complications when later trimming, cutting, etc.

Under certain circumstances satisfactory registration can be obtained with the two gauge pins on the cylinder while using only two feed rolls in line with those gauge pins. A difficulty arises here, however, since sheets are ordinarily at rest when first gripped by the feed rolls and must be accelerated to a speed higher than cylinder speed. If the sheets are relatively heavy, and only two feed rolls are used, there might be slippage between the feed rolls

and the sheet while the rolls are bringing it to speed. This, of course, increases the possibility of misregister.

According to a main feature of this invention, two gauge pins are provided on the cylinder and several sets of feed rolls are provided, two or more of which are generally aligned with the gauge pins, that is to say one set may be directly in line with each gauge pin or a set may be disposed on each side of but close to that line. All of the rolls across the width of the machine are adapted to grip the sheet while it is at rest and to commence feeding it toward the gauge pins, and all rolls but those aligned with the gauge pins are adapted to release the sheet before its front edge reaches the gauge pins. Final registration of the sheet against the gauge pins is accomplished by overfeeding with only the rolls in line with the pins. Another feature of this invention is to provide means for adapting a conventional paper feed roll registering device of the type mentioned earlier with the above improvements for feeding of cardboard having relatively irregular edges.

It is therefore a principal object of this invention to provide feed roll means for feeding untrimmed sheets to gauge pins on a rotating cylinder and to register the sheets against the pins.

Another object of the invention is to adapt a plurality of pairs of feed rolls to positively grip and commence feeding relatively stiff sheets against a pair of gauge pins on a cylinder, only said rolls in line with the pins providing the driving force for final registration of the sheet against the gauge pins.

Another object of the invention is to provide mechanism comprising a plurality of gauge pins on a cylinder and a plurality of pairs of feed rolls for use in registering paper sheets against the gauge pins, means being provided and said gauge pins and feed rolls being so adapted when feeding untrimmed cardboard sheets that all of said feed rolls take and commence feeding a sheet toward the gauge pins, all but two spaced pairs of feed rolls aligned in the direction of feed with two gauge pins on the cylinder release said sheet as it approaches the gauge pins, and final registration of the cardboard sheet against said two gauge pins is accomplished by said two feed rolls aligned therewith.

A further object of the invention is to provide a method of utilizing conventional feed roll registering mechanism for feeding and registering stiff, heavy sheet material having relatively irregular edges.

Another object is the provision of two different sets of upper and lower nipper rolls which, when arranged for cardboard feeding, cause one set to accelerate the sheets and then let them go, while the other set embodying only two pairs of nipper rolls, continues to exert a forwarding action advancing the sheets gently into contact with two gauge pins on the cylinder in line with the second named pairs of nipper rolls.

Other objects and features of novelty will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is a simplified perspective view of front register mechanism embodying the invention.

Fig. 2 is a schematic elevational view showing the front stops and side register means on a feed board with a sheet front and side registered and about to be advanced by nipper rolls into a printing or other sheet handling machine.

Figs. 3, 4, 5, and 6 are fragmental schematic views of the front registering mechanism arranged for the feeding of cardboard sheets and showing successive stages of sheet movement.

Figs. 7, 8, and 9 are fragmental schematic views of the

mechanism adjusted for the feeding of paper sheets and showing successive stages of movement of a sheet as it is advanced into engagement with gauge pins on a revolving cylinder.

Fig. 10 is a perspective view similar to that of Fig. 1, showing a modification wherein all of the upper nipper rolls are of the same size, and wherein certain of the lower nipper rolls, after being in operative relation with the upper rolls, drop down before the sheet strikes the gauge pins on the cylinder.

Figs. 11, 12, 13 and 14 are fragmental schematic views of the front registering mechanism of Fig. 10 arranged for the feeding of cardboard sheets and showing successive stages of sheet movement.

Figs. 15, 16, and 17 are schematic views of the Fig. 10 mechanism arranged for the feeding of paper sheets, and showing successive stages of movement of a sheet as it is advanced into engagement with the gauge pins on a revolving cylinder.

The construction of the present invention follows the prior art in some respects. It comprises a feed board down which sheets are moved by tapes or equivalent means. Front stops rise from below the sheet path to stop and preliminarily front register the sheet. Immediately thereafter the sheet is drawn sidewise against a side gauge. While the sheet still bears against the front stops it is gripped between top and bottom nipper or feed rolls which are stationary at that instant. The front stops then drop out of the way and the nipper rolls begin to accelerate for driving the sheet forward. The sheet is driven forward until its front edge contacts gauge pins on a revolving cylinder which has a surface speed slightly less than that of the nipper rolls at the time so that the sheet is forced against the gauge pins to properly finally front register it, whereupon the grippers on the cylinder close and the nipper rolls release the sheet. After that it is carried into the press or other sheet handling machine under the control of that machine exclusively.

A preferred form of the present invention departs from the known art as above outlined in that the upper nipper rolls are in two different sets, one set comprising a substantial number of pairs of upper and lower nipper rolls extending transversely of the machine and the second set consisting of two pairs of nipper rolls only spaced laterally upon opposite sides of the center of the sheets to be forwarded. The upper rolls of the second set are so constituted that a rear portion of their feed sectors may remain effective after the feed sectors of the other set have passed the lower nipper rolls; in other words, after the sectors of the first set have rotated out of contact with the sheet. However, the timing of the nipper roll shaft carrying the upper rolls may be set forward or backward to make the rear portions of the feed sectors of the second set effective, as when feeding cardboard sheets, or ineffective as when feeding paper sheets. Preferably this is accomplished by making the front ends of the feeding sectors of all upper nipper rolls even across the machine and making the feed sectors of the second set longer than those of the first set. However, as one modification all of the feed sectors may be made of the same length and those of the second set angularly disposed on the shaft somewhat behind those of the first set.

Referring to Figs. 1 to 9 of the drawing, a feed board of more or less conventional character is indicated at **10**, over which sheets are fed as by means of endless tapes indicated at **21** in Fig. 2. **11** is a cylinder which may be driven at non-uniform speed, as by mechanism disclosed in Wood Patent No. 2,746,312, dated May 22, 1956, with two different constant speed periods and intervening periods of acceleration and deceleration.

12 is a shaft which has bearings in the machine frame disposing it parallel to cylinder **11** and above feed board **10**. On the shaft **12** a set of nipper or feed rolls **13** are fixed. These rolls for the greater part of their periphery are cut away to leave active feed sectors of uniform radius which have a given length or angle. They are similarly disposed angularly of the shaft so that their action is uniform across the width of the machine.

A series of lower idler nipper rolls **14** of circular contour are mounted beneath the feed board and beneath the nipper rolls **13**. Rolls **14** are carried at the free ends of short arms **15** which swing upon pivots **16**. By suitable mechanism known in the art and not herein shown, the arms swing up to pinch each sheet between the nipper rolls **13** and **14** at a time when a sheet is stopped and front registered against front stops **17**. The arms swing down to move the rollers **14** out of contact with the sheet at a later point in the cycle. The rolls **14** are spring urged toward rolls **13** and have an upper limit of travel a few thousandths of an inch above normal sheet-contacting position.

The front stops **17**, of which there are at least two although preferably more, move up and down in conventional manner about fixed pivots **18**. As soon as a sheet is front registered against stops **17** it is drawn sidewise by side registering mechanism which may embody upper and lower wheels **19** and **20**, one of which may be driven. A suitable side-gauge, not shown, limits the extent of sidewise movement.

Shaft **12** is driven in a non-uniform manner to have a short stationary period during which the lower nipper rolls **14** rise to press a sheet against the outer perimeter of the rolls **13**, an accelerating period during which the sheet reaches a surface speed somewhat greater than the speed of cylinder **11** at the moment for driving the sheet forward against gauge pins on the cylinder, an idler period and a further period of rotation to bring the rolls back to the Fig. 2 position. Thus the shaft has acceleration and deceleration periods and different stationary periods for each complete revolution, and there is one such revolution for each sheet fed. At all times except when the shaft **12** is turning rapidly and the feed sectors of the nipper rolls **13** are cooperating with the lower nipper rolls **14** to forward a sheet, the cut-away portions of the nipper rolls **13** are disposed above the front stops so as to clear the sheets.

In addition to the nipper rolls **13**, shaft **12** also carries a pair of nipper or feed rolls **23** beneath which are lower idler nipper rolls **24**, the latter being mounted to move up and down simultaneously with the lower nipper rolls **14** in the embodiment shown. Nipper rolls **23** have feed sectors the forward ends of which are even angularly with the forward ends of rolls **13**. Rolls **23**, however, have longer feed sectors than rolls **13**, so that they project behind rollers **13**.

Shaft **12** is adjustable relative to its driving mechanism so that it may assume either of two different angular positions. Its driving mechanism which may be associated with the non-uniform driving mechanism for cylinder **11** to impart the periods of constant rotation and those of acceleration and deceleration to the upper nipper rolls previously mentioned, may comprise a pair of gears **25**, **26** rotating in a non-uniform manner. One end of shaft **12** is fixed to a circular plate **27** which is adjustably mounted on gear **26** by means of screw and slot connections **28**, **29**. When the drive is to be adjusted for feeding cardboard, as in Figs. 1 to 6 inclusive, screws **28** are loosened and shaft **12** and plate **27** are rotated clockwise with respect to gear **29** after which the screws are again tightened. When, however, it is desired to feed paper sheets, as in Figs. 7, 8 and 9, the screws are loosened and the shaft **12** with plate **27** are rotated counterclockwise with respect to gear **26**.

In the feeding of cardboard sheets, as in Figs. 3 to 6 inclusive, the nipper rolls on shaft **12** become effective later in the cycle, that is the forward ends of the sectors of the upper nipper rolls extend a certain distance beyond the lower rollers **14**, **24** when shaft **12** is stationary and the lower rolls rise to grip the sheet as indicated in Fig. 3.

The sheet S is then accelerated by the nipper rolls **13** and **23** through the position of Fig. 4. Shortly thereafter the feed sectors of the nipper rolls **13** will have passed beyond lower rolls **14** so that the feed sectors of rolls **13** will be ineffective for pushing the sheets forward somewhat before the position of Fig. 5 is reached. However, at that position the feed sectors of the nipper rolls **23** are still effective and the sheet is pushed forward by those sectors alone until it contacts gauge pins **30** on cylinder **11** in line with the nipper rolls **23**. Immediately thereafter sheet grippers **31** on the cylinder close upon the sheet and the rolls **24** drop as in Fig. 6. The sheet is now under the control exclusively of the grippers on the cylinder. The gauge pins **30** are mounted in the gap of the cylinder. When feeding cardboard it is desirable to front register on the cylinder at two points only, and these points are preferably directly in line with the two nipper rolls **23** which effect the final front registration of the sheet after the accelerating effort from nipper rolls **13** has ceased. These particular gauge pins are shown in full lines in Fig. 1. Other gauge pins **30** shown in dotted lines are used additionally when feeding paper sheets.

If all of the nipper rolls were effective to advance a cardboard sheet into contact with the two spaced gauge pins, there would be a tendency for the sheet between the two gauge pins and on the far sides of the gauge pins to advance beyond them, which would distort the sheet by buckling and bowing and interfere with accurate registration of a printed image thereon. This undesirable effect is absent, however, where the final push to the sheet is in line only with two selected gauge pins.

Now assuming that it is desired to operate the machine for feeding paper sheets, the operator adjusts shaft **12** and plate **27** counterclockwise to its other angular position. He also places into gauging position the gauge pins **30** shown in dotted lines. Such angular repositioning of the shaft causes both sets of rolls **13** and **23** with their corresponding idlers **14** and **24** to effectually grip and drive the sheet forward against all of the gauge pins **30**. The sheet then continues to be gripped and fed forward until about the position of Fig. 9 at which point the sheet will have contacted all of the gauge pins **30** and the sheet grippers **31** will have closed upon the sheet. The lower nipper rolls **14** and **24** will now drop to discontinue driving the sheet forward. Hence the final portion of the feed sectors of the nipper rolls **23** will be ineffective and the same feeding effort will be experienced as though all of the nipper rolls had the same length of feed sectors.

Other modifications are within the purview of this invention. In all cases, however, it is necessary when feeding cardboard sheets that the sheet be started from rest all across the machine but that the forwarding impulse be stopped before the sheet strikes the two spaced gauge pins except at points in line with the gauge pins, the forwarding impulse being continued at those points until the sheet strikes the gauge pins.

In the modification of Figs. 10 to 17 inclusive, a similar result is obtained by a different arrangement of somewhat different elements. In this embodiment of the invention the shaft **32**, similar to shaft **12** of the first embodiment, is driven in any suitable manner from the shaft of cylinder **11** so as to have a stationary period, an acceleration period, and a deceleration period, the sheet being in engagement with stops **17** during the stationary period, being forwarded during the acceleration period, and being out of contact with the nipper rolls during the deceleration period. The shaft **32** functions in a manner similar to that of shaft **12**, but need not be adjustable as is the latter shaft.

On the shaft **32** there are fixed a series of upper sector shaped nipper or feed rolls **33** and **34**, which may be identical in shape and size, the various rolls **33** and **34** having the same angular positions all across the width of the machine. The sector shaped nipper rolls in longitudinal alignment with the gauge pins **30** are distinguished from the other similar upper nipper rolls by being numbered **34** rather than **33**.

Under each sector shaped nipper roll **33** there is a cooperating circular nipper roll **35**, while beneath the sector shaped nipper rolls **34** there are circular nipper rolls **36**. The various lower rolls **35** are each mounted at the forward end of an arm **37** that is pivoted upon a transverse rod **38** mounted in the frame of the machine.

The rolls **36** are mounted at the forward ends of similar arms **39**. At the rear end of each arm **37** there is an approximately vertical operating bar **40** which moves up and down in timed relation. The bars **40** are moved to lowered position to raise rolls **35** to operative position at the beginning of the forwarding action of the nipper rolls when a strong acceleration effort is desired, as indicated in Fig. 11. Shortly thereafter these bars **40** rise to depress rollers **36**, as indicated in Fig. 12. The forwarding impetus of the rolls **35** is then discontinued. However, the rolls **36** which are raised simultaneously with rolls **35** continue in operative position as illustrated in Figs. 12 and 13 and continue to drive the sheet forward and up against the gauge pins **30** until the sheet is taken by the grippers **31**. For this purpose vertical operating bars **41** are pivotally connected to the rear ends of the arms **39** which carry the rolls **36**. After the sheet is gripped, the bars **41** rise and the rollers **36** descend, the sheet then being under the control of the grippers **31** only. The bars **40** and **41** may be raised and lowered to accomplish the operation of rollers **35** and **36** by any suitable means properly related to the irregular rotation of the cylinder **11**.

In Figs. 15, 16, and 17 the sheets being fed are of ordinary paper stock, and the problem of eliminating buckling and bowing is not present, as it is where cardboard is being fed. In the case of paper sheets there is no necessity for lowering the nipper rolls **35** before the sheet strikes the gauge pins. In fact, in paper feeding the gauge pins illustrated in dotted lines may be brought into operative position and all of the pairs of nipper rolls actuated to give the sheet a forwarding impetus throughout its width, and to continue that impulse until the sheet strikes the gauge pins. Hence, the operating bars **40** and **41** may maintain the rolls **35** and **36** in upper operative position until the sheet is grasped by the sheet grippers **31**, as shown in Fig. 17, whereupon the bars **40** and **41** may be raised in unison to release the sheet, which is thereafter in control of the press or other sheet handling machine exclusively.

Thus, it will be observed that in the feeding of cardboard sheets, according to the first described form of the invention, the sheet forwarding impulse other than that behind the two gauge pins is relieved by making the sectors shorter than those behind the gauge pins, while in the second described form a similar result is accomplished by holding the lower nipper rolls in operative relation with the sectors behind the gauge pins for a longer time than those which are positioned beneath the remaining sectors. In both cases, the final push to the sheet takes place only from the nipper rolls in line with the gauge pins, thereby avoiding distortion or buckling and bowing of the sheet because of a feeding impulse imparted to it at points not directly behind the gauge pins.

Having thus described my invention, I claim:

1. In the method of feeding sheet material to a rotating cylinder having grippers adapted to hold a sheet after it has been registered against a pair of spaced gauge pins mounted on the cylinder and wherein a sheet moving toward the cylinder is stopped and preliminarily front and side registered and the stopped sheet is then gripped top and bottom at a plurality of spaced points across its width and near its front edge and moved toward the gauge pins on the cylinder to feed the sheet, the steps comprising releasing the grip on said sheet at all points across its width not generally aligned with said gauge pins in the

direction of feed before the front edge reaches the gauge pins, completing the feeding of the sheet to the gauge pins at a speed relatively higher than cylinder speed at that time to finally front register the sheet against the gauge pins by gripping the sheet only at points in general alignment with the gauge pins, and releasing the sheet at the latter points in general alignment with the gauge pins after finally registering the sheet against the gauge pins.

2. In the method of feeding relatively stiff sheet material to a rotating cylinder having grippers adapted to hold a sheet after it has been registered against a plurality of spaced gauge pins mounted on the cylinder and wherein the sheet is moved toward registry against the gauge pins by gripping the sheet at a plurality of closely spaced points across its width and near its front edge, the steps of releasing the grip on said sheet at all points across its width not generally aligned with said gauge pins in the direction of feed as the front edge of the sheet approaches the gauge pins and continuing the feeding of a sheet with the latter grasped only at points in general alignment with the gauge pins and at a speed relatively higher than cylinder speed to overfeed the sheet and perform final front registration of the sheet against the gauge pins, grasping said finally registered sheet with said cylinder grippers, and thereafter releasing the sheet at the points in general alignment with said gauge pins.

3. Mechanism for feeding sheets from a stationary position on a feed board to a rotating sheet handling cylinder, comprising two gauge pins on said cylinder, one on each side of the center of the sheet path, a first plurality of upper and lower feed rolls arranged and operated to grip a sheet while stationary and drive it toward the gauge pins on said cylinder and thereafter release the sheet before it reaches said gauge pins, a second plurality of sets of upper and lower feed rolls arranged transversely of sheet movement and operated to grip the sheet and drive it toward said cylinder while said sheet is gripped by said first plurality of upper and lower feed rolls, said second plurality of feed rolls continuing their forwarding of the sheet after the first plurality of feed rolls have released it and until the sheet engages said gauge pins, and grippers on said cylinder arranged and operated to grip the forward edge of the sheet after it has been thus registered against said gauge pins, said second plurality of feed rolls releasing the sheet after it has been thus gripped.

4. In mechanism for registering sheet material on a cylinder carrying a plurality of grippers, a pair of gauge pins mounted on said cylinder slightly in advance of the gripping ends of said grippers, said gauge pins being spaced along said cylinder on opposite sides of a center line through the sheet handling machine, a feed board the forward end of which closely approaches the cylinder, means for stopping and preliminarily front and side registering a sheet approximately at the forward end of the feed board, a shaft extending parallel to said cylinder and operating once for each cylinder revolution, a plurality of closely spaced rolls on said shaft adapted to engage the stopped sheet and commence driving it toward the gauge pins on the cylinder, certain of said rolls being generally aligned with the gauge pins on said cylinder, said rolls driving said sheet forward at an accelerating speed, all of said driving rolls except those aligned with the gauge pins releasing the sheet before overfeeding takes place, the final registration being accomplished only by the rolls aligned with the gauge pins, and means operable to maintain said grippers opened during sheet registration against the gauge pins and to close said grippers after completion of final front registration, said rolls aligned with the gauge pins releasing said sheet after it has been taken by the cylinder grippers.

5. Mechanism according to claim 4 wherein said driving rolls are nipper rolls having feed sectors, the sectors of those rolls aligned with the gage pins disengaging the sheet later in the feed cycle than the remaining driving rolls.

6. Mechanism according to claim 4 wherein said shaft is on a fixed axis, and wherein an idler nipper roll is provided for each driving roll, said idler rolls being movable into and out of sheet engaging position to assist the driving rolls in feeding sheets to the gauge pins.

7. In mechanism for registering sheet material to a pair of spaced gauge pins on a cylinder of a sheet handling machine, grippers on said cylinder, said grippers being capable of being opened to receive a sheet and closed to hold the sheet for subsequent delivery to other holding means of said machine, means for stopping and preliminarily front and side registering a sheet with its front edge closely adjacent the cylinder, an intermittently driven shaft parallel to said cylinder, a plurality of rolls on said shaft adapted to engage and drive the sheet toward the gauge pins on the cylinder at a speed greater than cylinder speed at the time the sheet reaches the pins, an idler roll cooperating with each driving roll and being movable to and from engagement with the sheet to cause the sheet to be pinched between each idler and its corresponding driving roll, said driving rolls comprising a plurality of rolls each having a feed sector the driving periphery of which ends abruptly to discontinue driving engagement with the sheet as the front edge thereof approaches the gauge pins and comprising also a pair of rolls each one of which is aligned with a respective one of said gauge pins in the direction of sheet feed each of which latter rolls has a feed sector the driving periphery of which remains in engagement with the sheet after the former rolls release it to provide final front registration of the sheet against the gauge pins and each of which ends abruptly to discontinue driving engagement with the sheet after it has been registered and gripped by said grippers, and means for driving said shaft to effect the aforementioned operations.

8. In mechanism for registering relatively stiff sheet material against a pair of spaced gauge pins mounted on a rotating cylinder, grippers on said cylinder capable of opening and closing to receive and grip sheets respectively, a feed board the forward end of which closely approaches said cylinder, a set of driving rolls on a fixed axis parallel to said cylinder, a set of idler rolls one for each driving roll, one of said sets being above and the other being below said feed board, said idler rolls being movable toward and away from said driving rolls whereby a sheet may be pinched therebetween for subsequent driving to the gauge pins for front registration, there being a driving and idler roll aligned with each gauge pin in the direction of sheet feed, and means driving said driving rolls when a sheet is pinched to commence feeding of the sheet toward said gauge pins, all of said driving rolls and idler rolls but those aligned with said gauge pins being separated and thus prevented from having feeding action on the sheet as the front edge thereof approaches the gauge pins, the remaining rolls driving said sheet forward overfeeding it to said gauge pins and thus providing front registration thereagainst, said grippers closing upon said sheet after it has been front registered.

9. In sheet registering and feeding mechanism adapted for selectively feeding either paper or cardboard sheets to a rotating cylinder equipped with more than two spaced gauge pins and a plurality of sheet grippers, a feed board the forward end of which closely approaches the cylinder, nipper rolls aligned in the direction of sheet feed with certain of said gauge pins, all of said nipper rolls being closely adjacent the feed board and engageable with a sheet on the feed board, means driving the rolls to feed the sheet toward the gauge pins, all of said gauge pins being utilized for registration when feeding paper but all except two pins toward the ends of the cylinder being disabled when feeding cardboard, and adjustable means for causing all of said rolls to engage and drive the sheet against all of said gauge pins when feeding paper and for causing all of said feed rolls to commence feeding but

only those rolls aligned with the two gauge pins to continue feeding the sheet to final position against the gauge pins when feeding cardboard.

10. Mechanism according to claim 9 wherein said driving nipper rolls are provided on an intermittently driven shaft having a fixed axis, and wherein an idler nipper roll is provided for each driving nipper roll, said idler rolls being moved in timed relation into and out of sheet engaging position.

11. Mechanism according to claim 10 wherein, when said mechanism is adapted for feeding paper, all of said driving and idler rolls grip the sheet until after the cylinder grippers take the sheet and said rolls are then separated, and when said mechanism is adapted for feeding cardboard, all of said driving and idler rolls commence feeding, those driving and idler rolls other than the ones aligned with the two gauge pins separating as the front edge of the sheet approaches the pins, and the rolls aligned with the gauge pins providing final registration against the gauge pins, said latter rolls separating after the cylinder grippers take the sheet.

12. In a sheet registering mechanism adapted for the feeding selectively of either paper or cardboard sheets to a cylinder equipped with a plurality of gauge pins and a plurality of sheet grippers, a feed board the forward end of which closely approaches the cylinder, a shaft extending parallel to the cylinder adjacent the feed board, means for turning said shaft once for each revolution of said cylinder, and a plurality of nipper rolls on said shaft each of which has a feed sector, two of said nipper rolls located on opposite sides of the center of the shaft having their feed sectors so arranged as to leave the sheet path after the other sectors have left it, said last named nipper rolls being aligned in the direction of sheet feed with a correspondingly spaced pair of said gauge pins, the drive means for said shaft and the shaft itself being relatively adjustable angularly to advance the rear portions of those rolls other than said last named nipper rolls from their paper feeding positions to make them ineffective during final registration of the cardboard sheets against the gauge pins.

13. In a sheet registering mechanism adapted for the feeding selectively of paper or cardboard sheets to a cylinder equipped with a series of spaced gauge pins and a series of sheet grippers, a feed board the forward end of which closely approaches the cylinder, a shaft extending parallel to the cylinder adjacent the feed board, means for rotating said shaft once for each rotation of said cylinder, a plurality of nipper rolls each having a feed sector on said shaft adapted to feed sheets to said cylinder and against said gauge pins, two of said nipper rolls located on opposite sides of the center of the shaft having their feed sectors so arranged as to leave the sheet path after the other sectors have left it, said last named nipper rolls being in the feed paths through a correspondingly spaced pair of said gauge pins, the driving means for said shaft and the shaft itself being relatively adjustable angularly to make the rear portions of said last named nipper rolls effective after the other nipper rolls have left the feed path, whereby the gauge pins other than said spaced pair may be disabled for the feeding of cardboard sheets and whereby the said two spaced nipper rolls only function for the final feeding of the sheets against said two spaced gauge pins.

14. In a sheet registering mechanism adapted for the feeding selectively of either paper or cardboard sheets to a cylinder equipped with a plurality of gauge pins and a plurality of sheet grippers, a feed board the forward end of which closely approaches the cylinder, a shaft extending parallel to the cylinder above the feed board, means for turning said shaft once for each revolution of said cylinder, a plurality of nipper rolls on said shaft having feed sectors of a given angle and two nipper rolls having feed sectors of a greater angle, said last named sectors being in the feed paths through a spaced pair of said gauge pins, the forward portions of all of said sectors having the same angular position on said shaft, the drive means for said shaft and the shaft itself being relatively adjustable angularly from a position in which the feed sectors of all of said rolls drive a sheet against all of the gauge pins for feeding paper, to a second position in advance of said latter position for feeding cardboard in which the feed sectors of all of said rolls commence, feeding a sheet toward said gauge pins but the rear portions of said sectors of said given angle are ineffective during the final registration by the feed sectors or greater angle as they drive a cardboard sheet against said spaced pair of gauge pins.

15. In a sheet registering mechanism, a shaft disposed above the sheet path, means for turning said shaft one revolution for each feed cycle, a plurality of nipper rolls on said shaft having equal short feed sectors adapted to advance sheets into a printing press or other sheet handling machine, a second set of two nipper rolls having long feed sectors mounted on said shaft spaced laterally in each direction from the center of the shaft with their forward ends even with the forward ends of said short sectors, lower nipper rolls adapted to pinch sheets against said short and long feed sectors, means for dropping said lower rolls at a given point in each cycle, and means for adjusting said shaft angularly relative to its drive means to cause either said short sectors or said long sectors to pass said lower nipper rolls when they drop, whereby the sheets may be released either at the time the short sectors leave the sheet path or later at the time the long sectors leave it.

16. In a sheet registering mechanism adapted for the feeding selectively of paper or cardboard sheets to a cylinder equipped with a series of gauge pins and a series of sheet grippers, a feed board the forward end of which closely approaches the cylinder, a shaft extending parallel to the cylinder above the feed board, means for rotating said shaft once for each rotation of said cylinder, a plurality of nipper rolls on said shaft having equal short feed sectors adapted to advance sheets to said cylinder and against said gauge pins, a pair of long sector nipper rolls on said shaft on opposite sides of the center thereof with their forward ends even with the forward ends of said short sectors, said long sector rolls being in line with certain of said gauge pins, lower nipper rolls adapted to pinch sheets against said short and long feed sectors, means for dropping said lower rolls at a given point in each cycle, means for adjusting said shaft angularly relative to its drive means to cause either said short sectors or said long sectors to pass said lower nipper rolls at the instant they drop, whereby in the feeding of paper sheets the sheets may be released to the sheet grippers at the time the short sectors leave the sheet path or whereby for the feeding of cardboard sheets the gauge pins not in line with the long sectors may be disabled and the sheets may be released to the sheet grippers after the short sectors leave the sheet path, the long sectors only driving the sheet against the two remaining gauge pins.

17. Mechanism according to claim 3, wherein the upper feed rolls of the various pairs have equal length sectors, and wherein the timing and the length of operation of the driving impulse of each pair of feed rolls is controlled by the movement of the lower feed rolls of each pair upwardly and downwardly into and out of said gripping position.

18. In mechanism for registering sheet material to a pair of spaced gauge pins on a cylinder of a sheet handling machine, grippers on said cylinder, said grippers being capable of being opened to receive a sheet and closed to hold the sheet for subsequent delivery to other holding means of said machine, means for stopping and preliminarily front and side registering a sheet with its front edge closely adjacent the cylinder, an intermittently driven shaft parallel to said cylinder, a plurality of rolls on said shaft adapted to engage and drive the sheet to-

ward the gauge pins on the cylinder at a speed greater than cylinder speed at the time the sheet reaches the pins, an idler roll cooperating with each driving roll and being movable to and from engagement with the sheet to cause the sheet to be pinched between each idler roll and its corresponding driving roll to render the driving roll effective to forward the sheet, said driving rolls comprising a plurality of rolls which discontinue driving engagement with the sheet as the front edge thereof approaches the gauge pins and a pair of rolls each one of which is aligned with a respective one of said gauge pins in the direction of sheet feed each of which latter rolls remains in driving relationship with the sheet after the former rolls lose driving relationship to provide final front registration of the sheet against the gauge pins, and means for driving said shaft and actuating said idler rolls to

effect the afore-mentioned operations, and the movement of the idler rolls being timed to pinch the sheet and impart a forwarding impulse to it throughout its width at the start of the feeding operation, and those idler rolls in longitudinal alignment with the gauge pins continuing to pinch the sheet and impart a forwarding impulse thereto until the sheet strikes the gauge pins, while the remaining idler rolls are timed to release the sheet before it strikes the gauge pins.

References Cited in the file of this patent

UNITED STATES PATENTS

2,712,935	Gegenheimer	July 12, 1955
2,716,548	Fors	Aug. 30, 1955