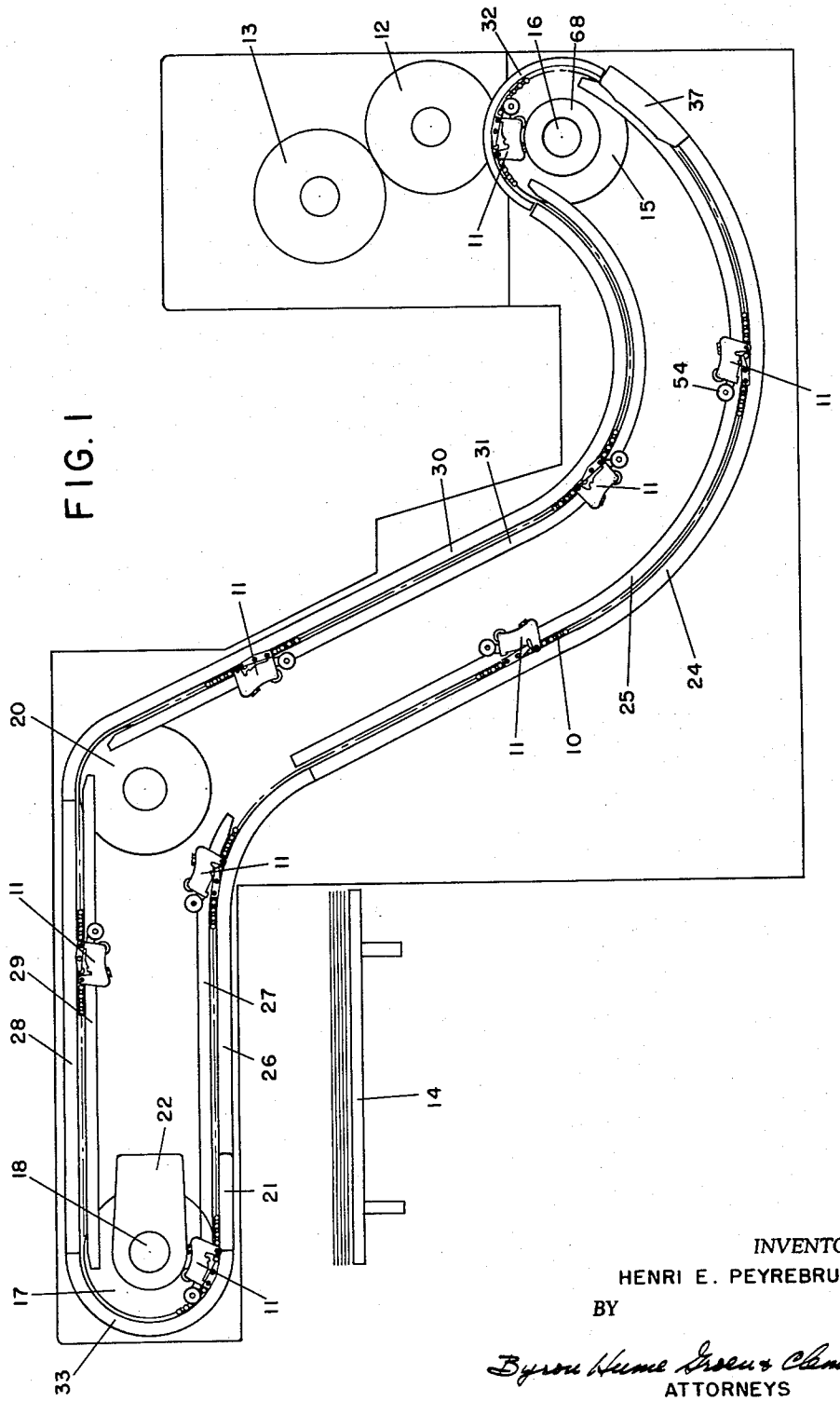
June 1, 1965 H. E. PEYREBRUNE 3,186,709

DELIVERY MECHANISM FOR PRINTING PRESSES

Filed June 18, 1963 5 Sheets-Sheet 1

FIG. 1



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DELIVERY MECHANISM FOR PRINTING PRESSES

Filed June 18, 1963 5 Sheets-Sheet 2

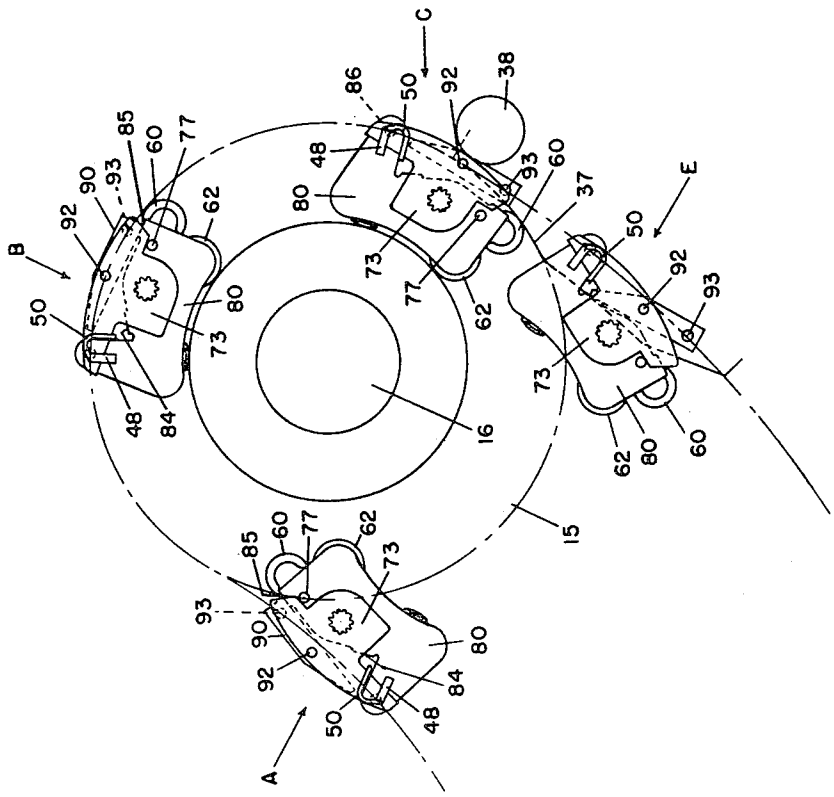


FIG. 2

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DELIVERY MECHANISM FOR PRINTING PRESSES

Filed June 18, 1963 5 Sheets-Sheet 3

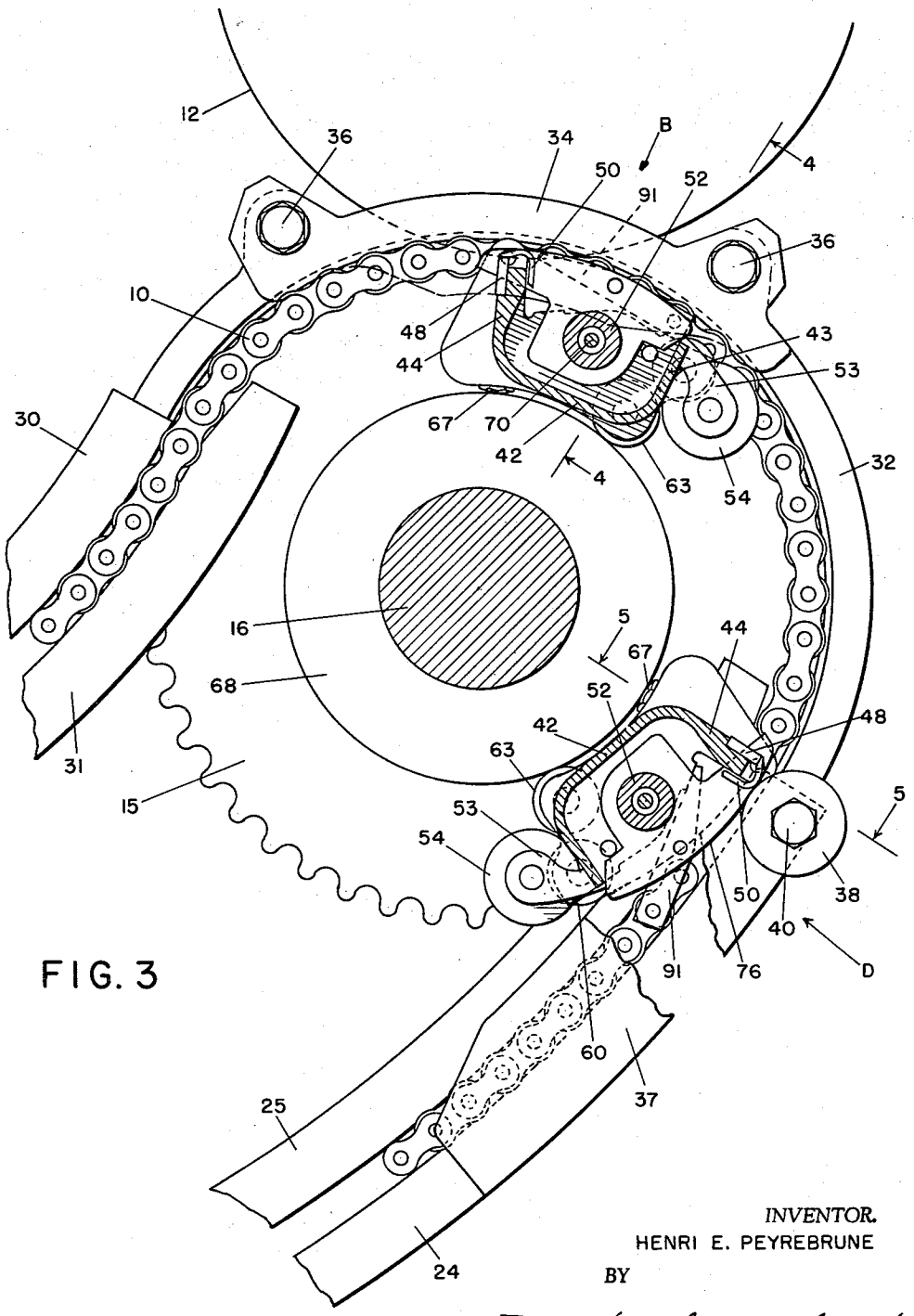


FIG. 3

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DELIVERY MECHANISM FOR PRINTING PRESSES

Filed June 18, 1963 5 Sheets-Sheet 4

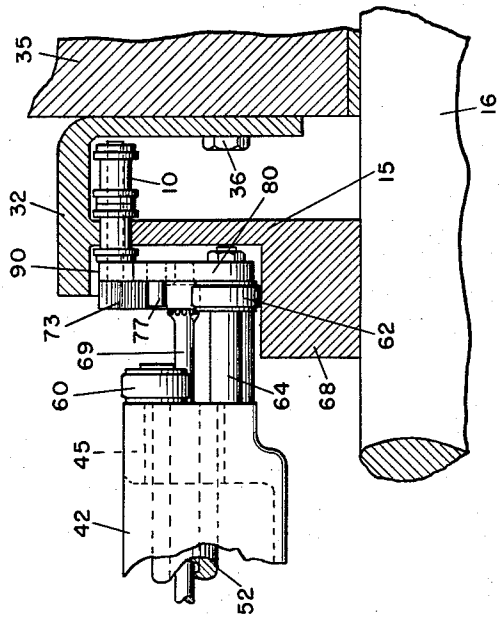


FIG. 4

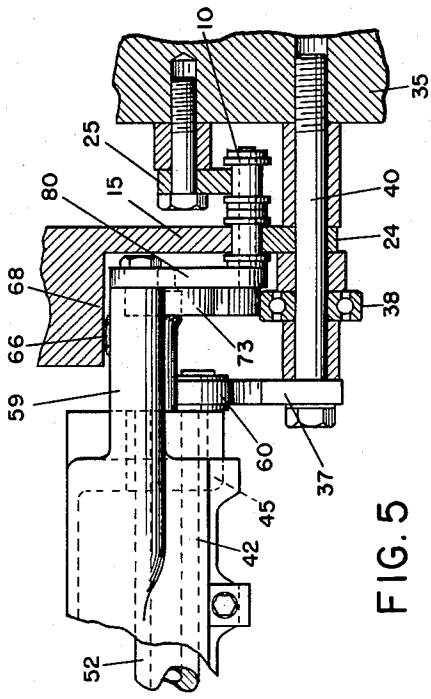
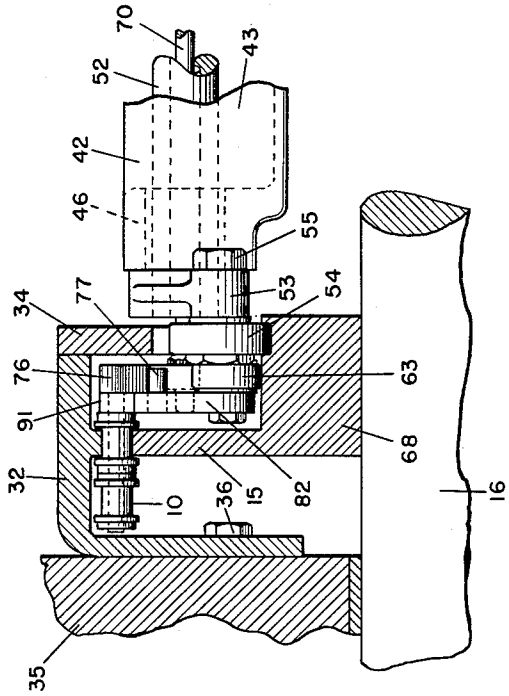


FIG. 5



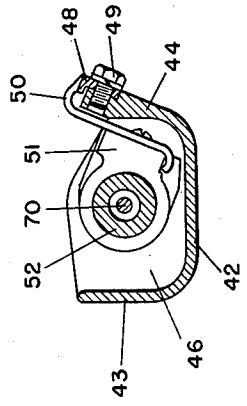


FIG. 10

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DELIVERY MECHANISM FOR PRINTING PRESSES

Filed June 18, 1963 5 Sheets-Sheet 5

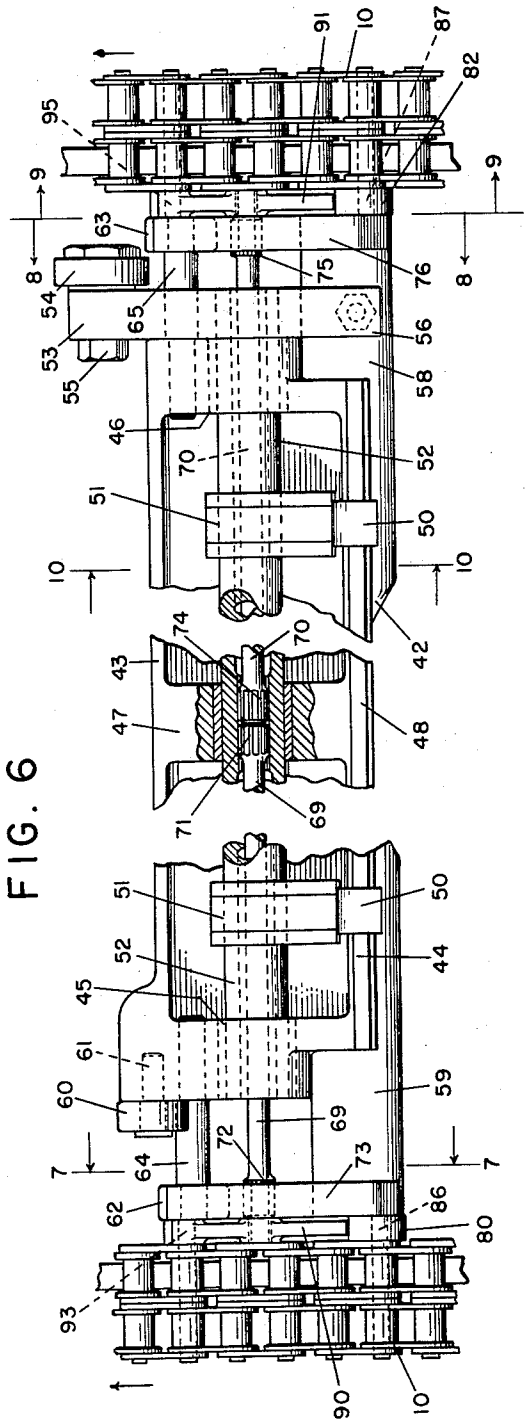


FIG. 6

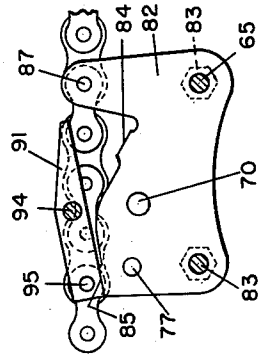


FIG. 9

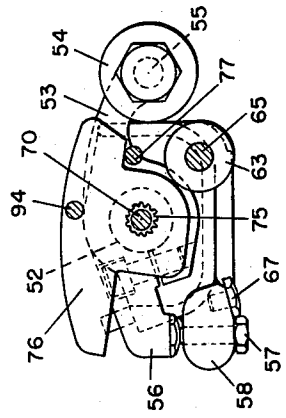


FIG. 8

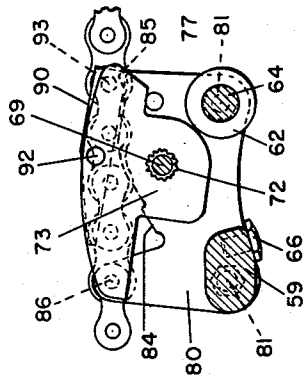


FIG. 7

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United States Patent Office 3,186,709 Patented June 1, 1965

3,186,709

DELIVERY MECHANISM FOR PRINTING PRESSES

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Filed June 18, 1963, Ser. No. 288,711
10 Claims. (Cl. 271—79)

The invention relates to delivery mechanisms for sheet fed printing presses and has reference in particular to improved means for controlling the gripper assemblies of endless chain sheet delivery mechanisms whereby the sheets are withdrawn from the impression cylinder at a constant speed and under uniform tension until the impression is completed on the trailing portion thereof.

Conventional chain delivery mechanisms used heretofore generally have been unsatisfactory because of the inherent tendency of the gripper elements to vary in speed and to vibrate excessively as they leave the path of high curvature around the chain sprockets adjacent the impression cylinder and enter a path of relatively low curvature in travelling toward the delivery pile. In most instances the impression on the trailing portion of the sheet is not completed until the delivery grippers, which have taken over control of the leading edge thereof, are well into the straight line or low curvature portion of their path of travel. Consequently any vibrations or slight variations in speed of the delivery gripper during this period will invariably affect the register of the impression on the trailing portion of the sheet.

To overcome this undesirable condition it has been customary to employ one or more transfer drums for transferring the sheets from the impression cylinder to the chain delivery conveyor so that proper control of the sheets is maintained until the impression is completed on the trailing portion thereof. These systems are effective for the purpose but they obviously require considerably more space and the additional equipment adds substantially to the cost of the press.

It is a primary object of the present invention therefore to provide an improved chain delivery conveyor having means for controlling the respective gripper assemblies whereby the sheets to be delivered will be withdrawn directly from the impression cylinder at a constant speed and under a constant, uniform tension until the impression is completed on the trailing portion thereof.

Another object of the invention is to provide improved sheet delivery mechanism of the character as described which will incorporate control discs and wherein the gripper assemblies are provided with rollers having coaction with the discs to maintain the said assemblies in proper radial relationship during the transfer period.

Another object is to provide chain delivery mechanism having gripper assemblies attached thereto in a manner employing toggle links and wherein said toggle links function to maintain the gripper pad surfaces of the assemblies tangent to the pitch line of the chains as they travel around the sprockets adjacent the impression cylinder.

A further object resides in the provision of endless chain delivery mechanism wherein a positioning cam is employed to shift the angular position of the gripper assemblies relative to the chains to thereby maintain the relationship between the gripper pads and the pitch line of the chains.

Another object is to provide improved chain delivery mechanism which will employ torsion rods having operative association with each gripper assembly and which will perform the dual purpose of yieldingly maintaining the sheet grippers in closed position against their pads and of keeping the chain attachment section under tension.

With these and various other objects in view the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is a side elevational view of sheet delivery mechanism of the endless chain type showing the gripper assemblies and chain guides of the invention in operative association therewith;

FIGURE 2 is a fragmentary schematic view illustrating in side elevation and in sequence the path of travel and mode of operation of a gripper assembly as it passes around the driving sprocket at the transfer end of the delivery mechanism;

FIGURE 3 is a fragmentary elevational view on an enlarged scale showing a gripper assembly in section and illustrating how the angular position of the assembly is shifted relative to the chains as it travels from a path of high curvature to a path of low curvature;

FIGURE 4 is a sectional view taken substantially on line 4—4 of FIGURE 3 and showing the sprockets, the chain tracks and the associated parts of the gripper assemblies on the feed side and on the drive side of the chain delivery mechanism;

FIGURE 5 is a sectional view taken substantially along line 5—5 of FIGURE 3;

FIGURE 6 is a top plan view, with parts in section, showing one of the gripper assemblies of the invention in attached relation to the links of an endless chain;

FIGURE 7 is a sectional view taken substantially along line 7—7 of FIGURE 6;

FIGURE 8 is a sectional view taken substantially along line 8—8 of FIGURE 6;

FIGURE 9 is a sectional view taken substantially along line 9—9 of FIGURE 6; and

FIGURE 10 is a sectional view taken substantially along line 10—10 of FIGURE 6.

FIGURE 1 shows an embodiment of the invention wherein the delivery mechanism is illustrated as comprising a pair of spaced endless chains **10** having a plurality of transversely disposed gripper assemblies **11** connected thereto at spaced intervals. Each gripper assembly includes gripper elements which are adapted to take a sheet from the impression cylinder **12**, after it has received an impression from the coacting plate cylinder **13**, and convey it to the delivery table **14**.

At the end of the delivery mechanism adjacent the impression cylinder **12** and which will be referred to hereinafter as the transfer end, the endless chains pass over spaced sprockets **15** which are mounted on the shaft **16**. At the opposite or delivery end of the conveyor the chains pass around spaced sprockets **17** mounted on the shaft **18** and additional idler sprockets **20** are located intermediate the sprockets **15** and **17** to provide support for the upper return runs of the chains.

The sprockets **17** and **20** are merely idler sprockets which serve to support and guide the chains as they travel in their curvilinear path and the conveyor mechanism is arranged to be driven by the sprockets **15**. The shaft **16** on which the sprockets **15** are mounted is adapted to be driven in a conventional manner by means of a gear, not shown, which meshes with a drive gear on the shaft of the impression cylinder **12**. The pitch diameter of the sprockets **15** is substantially equal to the bearer diameter of the impression cylinder and therefore the chains **10** will travel at a lineal speed equal to the peripheral speed of the impression cylinder. The driving of the chains at cylinder speed is essential in order to assure that the sheets will be withdrawn therefrom at a constant speed

and under a uniform tension until the trailing portion thereof has passed from the nip between the plate and impression cylinders.

Between the respective sprockets the path of the endless chains is controlled by guide tracks located on each side of the delivery frame as is clearly evident from FIGURE 1.

Between the respective sprockets the path of the endless chains on each side of the press is precisely controlled by guide tracks having a contour as is clearly evident from FIGURE 1. The intermediate guide tracks on the delivery run are indicated by numerals **24, 25** and **26, 27**. On the return run, the guide tracks include the elements **28, 29** and **30, 31**. The links of the double width chains are adapted to travel between the coacting tracks as, for example, between tracks **24, 25**, see FIGURE 5. At the transfer end the semi-circular guide tracks **32** extend around in an outwardly spaced relation with respect to the sprockets **15** so that the sprockets are able to receive and accommodate the links of the chains. At the delivery end, similar guide tracks **33** are associated with the sprockets **17**.

Also at the delivery end are cams **21** and **22** which function to open the delivery grippers and to shift the angular position of the gripper assemblies, respectively, as said assemblies approach the end of the delivery table **14** as will be more fully explained hereinafter.

At the transfer end of the chain conveyors the invention provides a stationary cam **34** as best shown in FIGURE 3, which is fixed to the frame members **35**, FIGURE 4, by the bolts **36**, and which cam controls the opening and closing action of the delivery grippers to effect transfer of a sheet from the impression cylinder to the sheet delivery mechanism. Also at this transfer end the invention provides a second cam **37** in clockwise spaced relation to cam **34** and which is associated with the roller **38**. The bolt **40**, FIGURE 5, positions and journals the roller **38** and said bolt also assists in fixedly securing the cam **37** to the frame members **35**.

The gripper assemblies as provided by the invention are best shown in FIGURES 6 to 10, inclusive. It will be understood that the said gripper assemblies include sheet gripper fingers and coacting pads and that said assemblies are articulatedly connected at their respective ends to the links of the endless chains. Each gripper assembly includes a carriage or housing **42**, FIGURE 10, having the longitudinal side walls **43** and **44** and the end walls **45** and **46**. Intermediate the length of the housing a center partition **47** is provided, FIGURE 6, and a series of gripper pads **48** are fixed to wall **44** in proper spaced relation by the securing screws **49**. The sheet gripper fingers **50** engage with the top surfaces of the respective pads **48** to hold and grip a sheet and said fingers are secured to members **51** mounted on and fixed to the gripper shaft **52**. The shaft is journalled centrally by the partition wall **47** and at its respective ends by the end walls **45** and **46**. At the feed side of the gripper assemblies, the shaft **52** extends beyond the wall **46** to receive the actuating lever **53**. Said lever **53** is clamped securely to the shaft and it carries at its forward end a roller **54** which is rotatably mounted by the bolt **55**. The opposite end **56** of the actuating lever is positioned by an adjustable stop **57** which is threaded into the extension **58** of the end wall **46**.

The housing **42** carries a second roller **60** which is journalled by the stud **61** suitably fixed to wall **45** and it will be observed that both rollers **54** and **60** are located at the forward side of the gripper housing as illustrated in FIGURE 6. Additional rollers identified by numerals **62** and **63** are also carried by the housing **42** of each gripper assembly. Roller **62** is located on the drive side being suitably mounted for rotation by the stud shaft **64** whereas roller **63** is located on the feed side and is mounted for rotation by the stud shaft **65**.

The housing **42** also is provided with a stop button **66** on the drive side thereof which is threaded into extension **59**, see FIGURE 7, and a similar stop button **67** is threaded into extension **58** on the feed side thereof.

With reference to FIGURE 3 it will be evident that as each gripper assembly travels in the path of high curvature about the sprockets **15**, the respective rollers **62–63** and coacting stop buttons **66–67** at each end of the assembly will engage the surfaces of control discs **68** formed on the inner faces of the respective sprockets **15** and will function to positively maintain the assemblies and thus the sheet engaging surfaces of the gripper pads **48** at a precise distance radially with respect to the axis of the shaft **16**.

Such positive control of the assemblies is essential as they pass through the transfer zone with respect to the impression cylinder to insure that each sheet will be accurately transferred from the cylinder grippers to the delivery grippers without vibration or any differential of speed between the respective grippers.

Constant tension is exerted on the gripper shaft **52** to thereby maintain the gripper fingers **50** closed on the gripper pads **48** by means of torsion rods **69** and **70**, which extend longitudinally within the hollow shaft. One end of the rod **69** is fixed by the splines **71** to the shaft **52** approximately centrally thereof and its opposite end extends beyond the end of the shaft and the wall **45** where it has a splined connection at **72** to an anchor member **73**. In a similar manner, one end of the torsion rod **70** is fixed by splines **74** to the shaft **52**, and its opposite end projects beyond the end of the shaft and the wall **46** where it has a splined connection at **75** with a second anchor member **76**. The terminal of each torsion rod extends beyond the respective anchor members and each rod is journalled by an end plate to be presently described.

The torsion bars are preloaded and accordingly they urge the gripper shaft in a clockwise direction, as seen in FIGURE 10, to maintain the gripper fingers **50** in closed relation on the pads **48**. The reactive force on the anchor members yieldingly urges the members in a direction to hold them in contact with stud pins **77**, FIGURES 7 and 8, which pins extend inwardly from the respective end plates which are secured to the housing at each end thereof.

On the drive side, as shown in FIGURE 6, the end plate **80** is fixed to the extension **59** and to the stud shaft **64** by the securing bolts **81**. On the feed side an end plate **82** is fixed to extension **58** and to the stud shaft **65** by the securing bolts **83**, FIGURE 9. Each end plate is provided with angularly disposed supporting ledges such as **84** and **85** and end plate **80** is fixed to a pin **86** of the conveyor chain at its side of the mechanism. End plate **82** is similarly fixed to its adjacent conveyor chain by a pin **87**.

An additional connection is provided for joining each gripper structure to the chain conveyors which in accordance with the invention includes a pair of toggle links **90** and **91**, FIGURE 6. The link **90** is disposed over and in alignment with end plate **80** and said link is pivotally supported on the anchor member **73** by the center pivot pin **92**. The link is connected to the chain conveyor on the drive side by the securing pin **93**, the said pin being spaced from connection **86** for approximately the length of the anchor member **73**. The toggle link **91** is associated with the end plate **82** in a similar manner having a pivotal connection to the anchor member **76** by means of the center pivot pin **94**. Also, the forward end of the link **91** is joined to its respective chain conveyor by the securing pin **95**. From the above description of the toggle links **90, 91** it will be understood that each link is capable of pivotal movement on its pivot pin either **92** or **94** from a position as illustrated in FIG. URE 9 wherein said links and thus the gripper assembly are maintained substantially parallel to the pitch line of the chain **10** illustrated in FIGURE 9, to an angular

or toggled position as illustrated in FIGURES 2 and 3, wherein both said links and the assembly assume an angular position relative to the pitch line of the chain.

From the foregoing description it will be evident that each end of each gripper assembly is connected to the chains 10 at two points. The connections at the pins 86 and 87 are made directly to the respective end plates 80 and 82 of the assemblies whereas the pins 93 and 95 are connected to the assembly through the toggle links 90 and 91. Accordingly, when the links 90 and 91 are toggled, the gripper assembly pivots about pins 86 and 87 between parallel and angular positions relative to the pitch line of the chains.

In the embodiment of the invention as illustrated, the pitch diameter of the sprockets 15 is the same as the diameter of the impression cylinder 12. Accordingly, the parts rotate at a one to one ratio and have the same peripheral speed. At the instant the leading edge of the sheet is being transferred to the sheet grippers 50 of a gripper assembly, the trailing portion of the sheet is still passing between the plate and the impression cylinder since the trailing portion is still being printed. In fact, the printing operation continues until the leading edge of the sheet leaves the path of high curvature and enters the track portion, that is the path of low curvature. It is therefore necessary to maintain a constant speed and constant tension on the sheet until the printing operation is completed because any disturbance of the sheet during this interval would cause a misregister of the impression along the trailing end. Accordingly, the structure of the invention maintains a true tangential relation between the gripper pads 48 and the pitch line of the sprockets 15.

The operation of the endless sheet conveyor will be best understood by reference to FIGURES 1, 2, 3, 4 and 5.

As each gripper assembly approaches the transfer end of the sheet delivery mechanism, see position A of FIGURE 2, it is positioned substantially parallel to the pitch line of the chain with the toggle links 90 and 91 in contact with the ledges 85 on the respective end plates 80 and 82. It will also be noted that in position A the gripping surfaces of the pads 48 are at an acute angle with respect to the pitch line of the chains. This is of no consequence at this point, however, because the assemblies have not as yet engaged a sheet.

As the assemblies enter the transfer zone with respect to the impression cylinder 12, position B in FIGURES 2 and 3, the rollers 62, 63 and the stop buttons 66, 67 engage the control discs 68 which, in conjunction with the chains 10, are effective to maintain the gripper assemblies at a precise distance radially with respect to the shaft 16 so that the leading edge of the sheet will be transferred accurately from the impression cylinder grippers to the delivery grippers. It also will be noted that at this point in their travel in the path of high curvature about the sprocket 15, the gripping surfaces of the pads 48 are maintained precisely tangent with the pitch line of the chains.

Transfer of the sheet is effected by the selective actuation of the sheet grippers on the impression cylinder and those carried by the gripper assemblies respectively. The grippers 50 are actuated to open and close by the travel of the roller 54 on the contoured surface of the cam 34. The actuating lever 53 is first oscillated to rock the gripper shaft 52 against the tension of the torsion rods 69 and 70 to open the grippers 50 and as the roller 54 moves off the cam 34, the tension of the torsion rods is effective to close the sheet grippers on the transferred sheet.

During the remainder of the travel of the gripper assemblies in the path of high curvature around the sprockets 15, the gripper pads are maintained tangent to the pitch line of the chains by the continued coaction of the rollers 62 and 63 and the studs 66 and 67 with the control discs 68. This relation of the parts continues until the gripper assemblies reach the position C and D of FIGURES 2 and 3, respectively.

At this point the assembly is about to pass from the path of high curvature about the sprocket 15 to a path of relatively low curvature as defined by the guide tracks 24 and 25 and, in order to maintain the tangential relationship of the gripper pads relative to the pitch line of the chains, it is necessary to shift the assemblies from their substantially parallel relation to a predetermined angular position relative to the pitch line of the chains.

Accordingly as the gripper assembly enters the transition zone it will be observed that the roller 60 engages the cam 37, the initial portion of which is formed concentric with the disc 68. The coaction between the roller 60 and cam 37 maintains the roller 63 in contact with the disc 68 beyond the point at which it would normally leave said disc and thus causes the leading end of the gripper assembly to be moved away from the chain as it pivots on the connecting pins 86 and 87. In position C of FIGURE 2 the assembly is shown as approximately halfway between its parallel and angular positions and it will be noted that the leading ends of the toggle links 90–91 have lost contact with the ledges 85 of the end plates 80–82 and that the pivot pin 94 which is carried by the anchor member 76 has moved to a position wherein it is substantially coincident with a plane drawn through the axes of the connecting pins 87 and 95.

The angular shifting of the assembly and toggle links continues until the assembly reaches the position indicated at D in FIGURE 3 at which point the roller 60 has reached the end of the concentric portion of cam 37 and the free end of the toggle link has engaged the ledge 84 of the end plate. At this point the assembly is at an angular position such that the surface of the gripper pad is tangent to the pitch line of the chain and this relationship will be maintained as indicated at position E of FIGURE 2 during the entire travel of the assembly through the low curvature portion of its path and until the trailing edge of the sheet is well beyond the nip of the plate and impression cylinders.

As the assembly leaves the low curvature path and travels upwardly and over the delivery pile, FIGURE 1, the relationship between the pad surface and the chains will vary but, because printing on the sheet will have been completed this is of no consequence. When the assemblies reach the front end of the delivery table 14 the roller 54 will engage the cam 21 to open the grippers and release the sheet. At the same time, the roller 63 will engage the cam 22 which will shift the assembly back to its parallel position relative to the chains, wherein it will remain until it arrives once again at the transition zone.

As the assembly passes through the transition zone the toggle links are permitted to pass through the dead center position as indicated in FIGURE 2–C by virtue of the fact that the pivot pin 94 is mounted in the anchor member 76. As stated previously, the anchor member is held against the pin 77 under the tension of the torsion bars. Consequently as the toggle links pass through the dead center position the pin 94 and the anchor member 76 are rocked slightly in a counterclockwise direction, as viewed in FIGURE 2–C against the tension of the torsion bars as indicated by the space between said member and the pin 77 in said figure. It will also be evident that the tension of the torsion bar will serve to maintain the toggle links in each of their toggle positions.

With further reference to FIGURES 2 and 3 it will be noted that as the assembly enters the transition zone, the arcuate surface 76 of the anchor member is engaged by the roller 38 mounted on the frame. The roller 38 serves to maintain the roller 63 and stop button 67 tight against the disc 68 thereby preventing any vibration of the chain as it leaves the sprocket from being imparted to the gripper assembly.

It also maintains the assembly under positive control

so that the action of the toggle link is continuous and smooth through its entire motion thereby avoiding any snap action as the toggle link passes over dead center and which would be transmitted through the sheet and thus affect the register of the impression on the trailing edge thereof.

Unless such control of the assemblies is provided it will be evident that as the assemblies pass from the path of high curvature to the path of low curvature the gripping surface of the pads 48 would shift from the tangential position of FIGURE 2–B to an angular position as indicated in FIGURE 2–A.

Since the sheet is still being printed at this point the change in the angular position of the pads will vary the tension on the sheet, causing it to shift relative to the surfaces of the plate and impression cylinders and thereby causing misregister.

With the present invention, the relationship of the pads to the pitch line of the chains is maintained constant until printing on the sheet is completed. Moreover, the assemblies are positively controlled by the coacting rollers, discs and cams so that any disturbance of the chains as they leave the sprockets will not be transmitted to the gripper assemblies.

Also, it will be noted that the pivot axis of the assembly, namely the axis formed by the pins 86 and 87, is substantially coincident with the center of the sheet engaging surface of the pads 48.

Consequently, the angular shifting motion of the assembly about this axis does not displace the pad longitudinally relative to the chains which otherwise would disturb the normal tension on the sheet.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In sheet delivery mechanism, in combination, a pair of endless chain conveyors in spaced relation and a pair of rotatable sprockets over which the chain conveyors pass at the transfer and delivery end respectively, guide tracks for the chain conveyors at the transfer end in spaced encircling relation with each sprocket at said end, a plurality of gripper assemblies extending transversely of the delivery mechanism in spaced relation along its length, and means securing each gripper assembly at its ends to the chain conveyors, said means respectively including a pivot connection adjacent the rearward side of each assembly joining the assembly directly to a chain conveyor, and a second pivot connection adjacent the forward side of each assembly and joining the assembly to said chain conveyor by means of a toggle link pivotally carried by the gripper assembly.

2. In sheet delivery mechanism as defined by claim 1, wherein the sheet gripping devices include a hollow gripper shaft journalled by its respective gripper assembly, sheet grippers fixed to the shaft and adapted to coact with gripper pads provided by the assembly, torsion rods located within the hollow shaft for tensioning the shaft in a direction to close the sheet grippers on their pads, the inner ends of said torsion rods being connected to said shaft an anchor member at each end of the gripper assembly for anchoring the respective outer ends of the torsion rods, and means pivotally mounting one of the said toggle links on each anchor member.

3. In sheet delivery mechanism, a pair of endless chain conveyors in spaced relation and a pair of rotatable sprockets over which the chain conveyors pass at the transfer and relivery end respectively, guide tracks for the chain conveyors at the transfer end in spaced encircling relation with each sprocket at said end and which define a path of high curvature, other guide tracks for the chain conveyors as they exit from the transfer end and which form a path of low curvature, a plurality of gripper assemblies extending transversely of the delivery mechanism along its length and being secured at their ends to the chain conveyors, each gripper assembly having a hollow gripper shaft journalled thereby, gripper fingers fixed to the gripper shaft, gripper pads provided by each assembly for coaction with the gripper fingers, torsion rods located within the hollow gripper shaft for tensioning the shaft in a direction to maintain the sheet grippers in closed relation on their pads, anchor members at each end of the shaft for anchoring the torsion rods, a toggle link located outwardly of each anchor member and being pivotally secured to its anchor member, and means securing each gripper assembly at its ends to the chain conveyors, said means respectively including a pivot connection adjacent the rearward side of each assembly joining the assembly directly to a chain conveyor, and a second pivot connection adjacent the forward side of each assembly for joining said chain conveyor to an end of one of said toggle links.

4. In sheet delivery mechanism as defined by claim 3, additionally including a disc having rotation with a sprocket at the transfer end and roller and stud combinations carried by the gripper assemblies for maintaining the sheet gripping surface of the pads thereof in tangential relation to the pitch line of the sprockets as the gripper assemblies travel the path of high curvature around the sprockets at said transfer end, each said roller and stud combination having contact with a disc as its particular gripper assembly travels around the said path of high curvature.

5. In sheet delivery mechanism as defined by claim 3, additionally including a disc having rotation with a sprocket at the transfer end and roller and stud combinations carried by the gripper assemblies for maintaining the sheet gripping surface of the pads thereof in tangential relation to the pitch line of the sprockets as the gripper structures travel the path of high curvature around the sprockets at said transfer end, each said roller and stud combination having contact with a disc as its particular gripper assembly travels around the said path of high curvature, and additional means for also maintaining the said tangential relation of the gripper pads to the pitch line as the gripper assemblies travel from the path of high curvature to a path of low curvature as the assemblies exit from the transfer end, said path of low curvature being formed by the said other guide tracks.

6. In sheet delivery mechanism as defined by claim 5, wherein said additional means includes a roller on the gripper assembly and a fixed cam member located at the start of the path of low curvature and with which the roller is adapted to have rolling contact, and a second roller in fixed position at the entrance end of said cam member and aligned with the anchor member on its end of the carriage assembly, said anchor member having rolling contact on the second roller, whereby the anchor member is controlled as the toggle link is caused to pivot to accommodate the divergent paths of travel of the gripper assembly and the chain conveyors during rolling contact of the roller on the said cam member.

7. In sheet delivery mechanism, in combination, a pair of endless chain conveyors in spaced relation and a pair of rotatable sprockets over which the chain conveyors pass at the transfer and delivery ends respectively, guide tracks for the chain conveyors at the transfer end in space encircling relation with each sprocket at said transfer end, a plurality of gripper assemblies extending transversely of the delivery mechanism in spaced relation along its length, pivot means for securing the gripper assemblies at their ends to the chain conveyors, respectively, sheet gripping devices including gripper pads carried by each gripper assembly, said gripper pads having their sheet engaging surfaces located in a plane coincident with the axis of said pivot means, a control disc mounted for rotation with each of said sprockets, and a roller and a stud

mounted in spaced relation at each end of each gripper assembly, the roller and stud combination at each end of a gripper assembly having coaction with a control disc to control the angular positioning of the gripper assembly as said assembly passes around the sprockets to thereby maintain the sheet engaging surfaces of the pads in a plane coincident with and precisely tangent to the pitch line of the chains.

8. In sheet delivery mechanism as defined by claim 7. wherein the sheet gripping devices additionally include a hollow gripper shaft journalled by its respective gripper assembly, sheet grippers fixed to the shaft and adapted to coact with the pads of its assembly, torsion rods located within the hollow gripper shaft and connected between said shaft and the assembly for tensioning the shaft in a direction to close the sheet grippers on their pads, an actuating lever fixed to the gripper shaft at one end thereof, and means for actuating the lever in a direction to open the sheet grippers against the tension of said torsion rods to receive a sheet.

9. In sheet delivery mechanism, in combination, a pair of endless chain conveyors in spaced relation, a pair of sprockets over which the chain conveyors pass and which define a path of high curvature, at least one gripper assembly extending transversely of the delivery mechanism, said gripper assembly being pivotally connected at each end to a chain conveyor for pivoting motion about a pivot axis coincident with the pitch line of said chain conveyors, gripper means on said assembly including a gripper pad having its sheet engaging surface located in a plane coincident with said pivot axis, control means on each sprocket for maintaining said pad surface at a radius concident with the pitch line of said conveyor chains as the gripper assembly passes through the path of high curvature about the sprockets, and positioning means on the gripper assembly having coaction with said control means to control the position of said gripper assembly about the pivot

axis to thereby maintain the plane of said pad surface tangent to the pitch line of said chain conveyors at a point coincident with said pivot axis.

10. In sheet delivery mechanism, a pair of endless chains, a pair of sprockets over which the chains pass and which define a path of high curvature, guide tracks for guiding the chains as they leave the sprockets and which define a path of low curvature, a plurality of gripper assemblies extending transversely between said chains, pivot means for connecting the gripper assemblies at each end to said chains and which permits said assemblies to pivot about an axis coincident with the pitch line of said chains, gripper means on said assemblies including gripper pads having their sheet engaging surface coincident with the axis of said pivot means whereby said surfaces travel at the same speed as said chains through the paths of high and low curvature, means including a control surface on each sprocket and coacting control elements on the gripper assembly for maintaining said assembly at a first angular position with respect to the chains wherein said pad surfaces are maintained tangent to the pitch line of the chains as they travel through said path of high curvature about the sprockets, and means for progressively pivoting the gripper assembly about its pivot axis to a second angular position as said assembly travels from the path of high curvature to the path of low curvature to thereby maintain the said pad surfaces tangent to the pitch line of the chains.

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