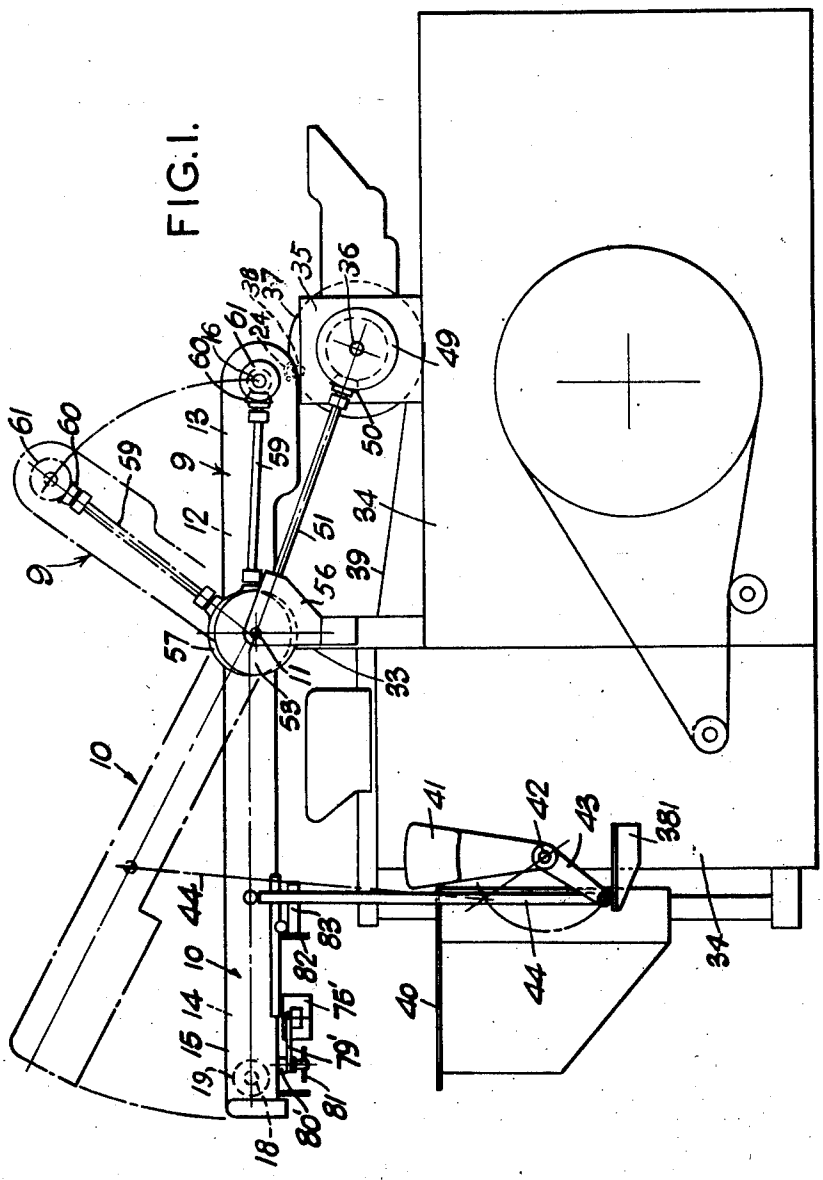
May 5, 1953 A. W. RANGER 2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Filed April 8, 1948 5 Sheets-Sheet 1

FIG. 1.



Inventor
Arthur W. Ranger
By J. Jenine
Atty.

May 5, 1953 A. W. RANGER 2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Filed April 8, 1948 5 Sheets-Sheet 2

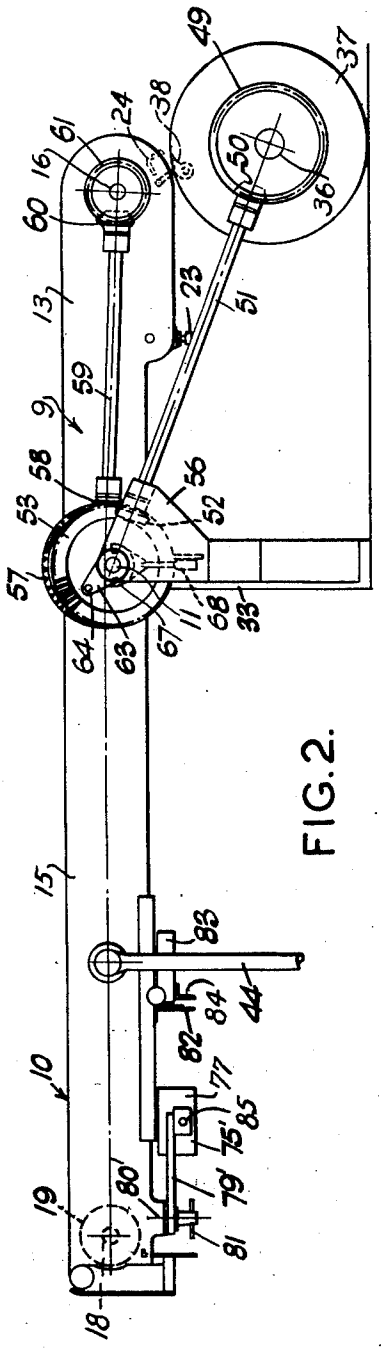


FIG. 2.

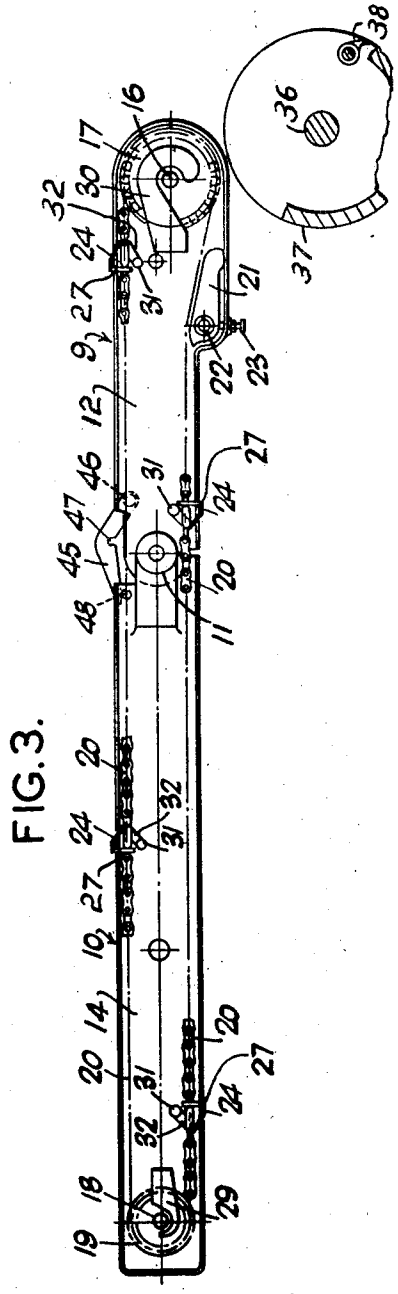


FIG. 3.

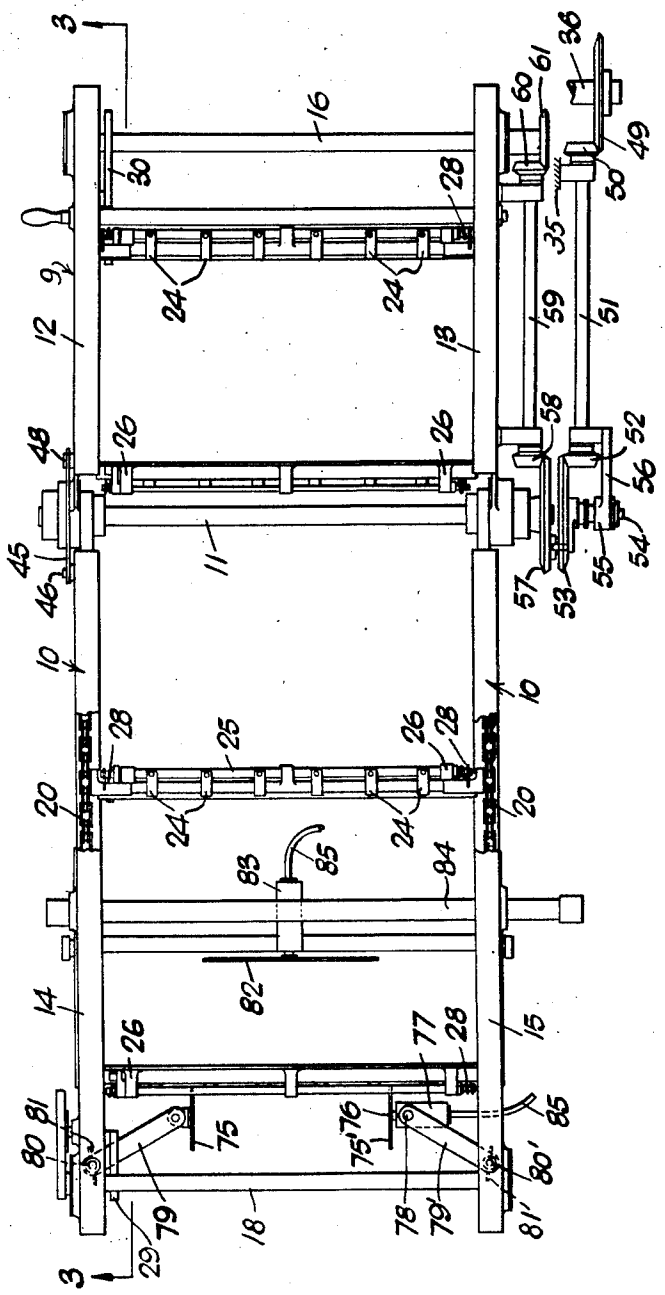
Inventor
Arthur W. Ranger
By
Atty.

May 5, 1953 A. W. RANGER 2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Filed April 8, 1948 5 Sheets-Sheet 3

FIG. 4.



Inventor:
Arthur W. Ranger
By J. Inwin
Atty.

May 5, 1953 A. W. RANGER 2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Filed April 8, 1948 5 Sheets-Sheet 4

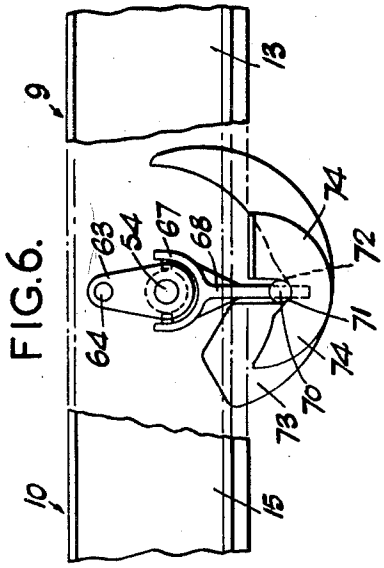


FIG. 6.

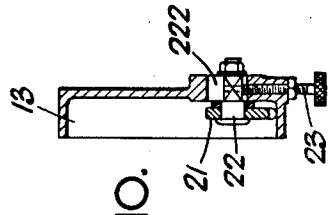


FIG. 10.

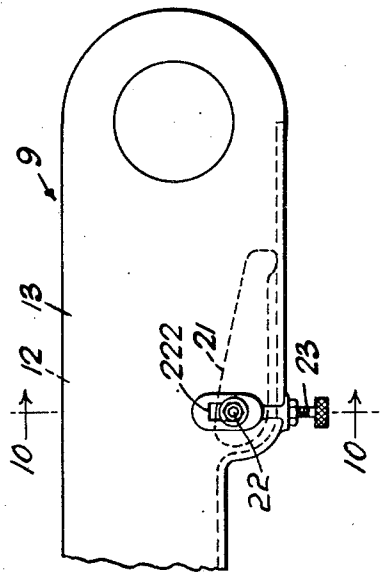


FIG. 9.

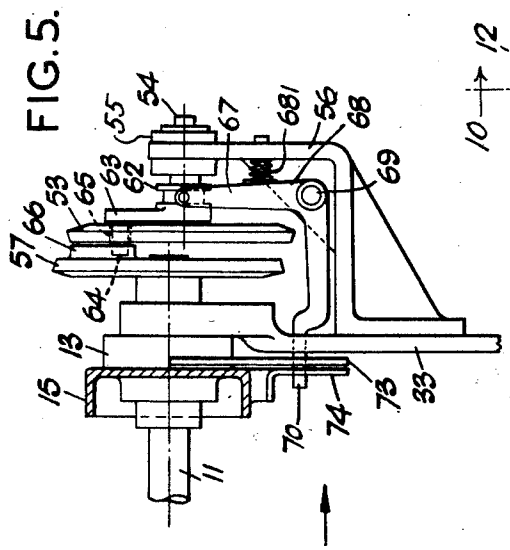


FIG. 5.

Inventor
Arthur W. Ranger
By
Atty.

May 5, 1953 A. W. RANGER 2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Filed April 8, 1948 5 Sheets-Sheet 5

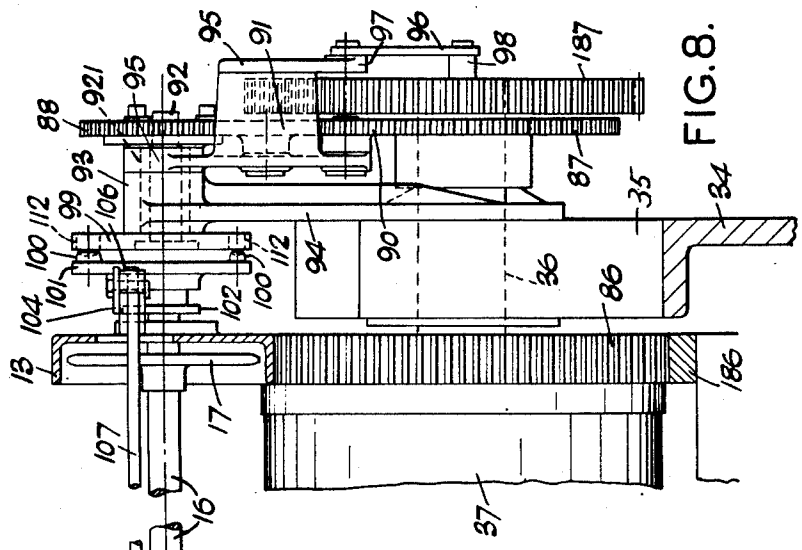


FIG. 8.

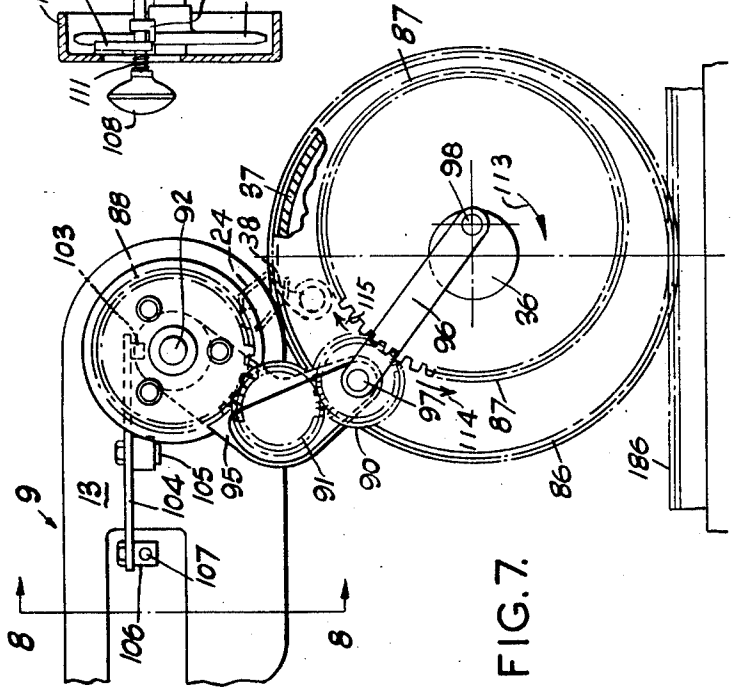


FIG. 7.

Inventor:
Arthur W. Ranger
By [illegible]
Atty.

Patented May 5, 1953

2,637,553

UNITED STATES PATENT OFFICE

2,637,553

SHEET DELIVERY APPARATUS FOR PRINTING MACHINES

Arthur Willard Ranger, Brighton, England

Application April 8, 1948, Serial No. 19,848
In Great Britain April 8, 1947

9 Claims. (Cl. 271—79)

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The invention relates to sheet delivery apparatus for printing machines.

It concerns delivery apparatus having an endless chain conveyor which is provided with spaced sets of mechanical grippers for successively engaging with the printed sheets on the impression cylinder and removing them from the cylinder and conveying them to and depositing them on a piling table, the apparatus being usually provided with joggers or vibrating plates for straightening the sheets on the pile.

Hitherto the conveyor has been mounted with its forward end on a cross shaft adjacent to the impression cylinder, the shaft being in a fixed position, and although in some instances the conveyor can be swung upwardly from its rear end about this shaft in order to allow access to the bed and piling table, the forward end of the conveyor forms an obstruction at that end which prevents access to the adjacent portion of the impression cylinder, and in the case of a cylinder machine with a sheet feeding mechanism at the same side as the delivery conveyor it prevents access to the lay board.

It is highly desirable that free access should be possible to the impression cylinder and the sheet lay board, as well as to the piling table and in some cases to the sheet feeding apparatus when "making ready," that is when the machine is being set ready for printing, or during cleaning, and the invention provides these advantages.

According to the invention, the endless chain delivery conveyor is composed of two sections hinged at their adjacent ends so that each section can be elevated about its hinged end independently of the other, thus permitting either or both of them to be raised and lowered as required.

Means are provided for disengaging the driving mechanism of the conveyor preferably automatically when either section is raised, so that it is possible to keep the machine running except the conveyor, when either or both sections are in the raised positions, the driving mechanism being re-engaged automatically when both sections are in the lowered or working positions.

Manually operated means may be provided to engage and disengage the driving mechanism of the conveyor.

A safety lock is preferably provided to hold the forward section when raised, and counterbalance mechanism for holding the rear section when raised.

In the application of such a sheet delivery

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conveyor to a single revolution cylinder flat bed printing machine in which the impression cylinder rotates at a non-uniform speed a variable speed mechanism is provided for driving the conveyor so that the grippers on the conveyor are synchronised with the cylinder.

The invention further includes the provision of joggers for the piling table which comprise guide plates vibrated by pneumatic devices so that their action is light and elastic and thereby avoids liability of injury to the machine minder.

In the accompanying drawings:

Figure 1 is a side view somewhat diagrammatically illustrating a continuously rotating cylinder flat bed printing machine with one form of sheet delivery apparatus according to the invention applied.

Figure 2 is a side view of one form of conveyor according to the invention,

Figure 3 being a sectional side view of the same conveyor on the line 3—3, Figure 4.

Figure 4 is a plan view of Figure 2.

Figure 5 is a front view of one form of clutch mechanism for enabling the drive of the conveyor to be engaged and disengaged automatically when either or both sections of the conveyor are lowered and raised, respectively.

Figure 6 is a somewhat diagrammatic side view of part of said clutch mechanism.

Figure 7 is a side view, and

Figure 8 is a rear sectional view on 8—8, Figure 7, illustrating another form of driving gear for the conveyor.

Figures 9 and 10 are, respectively, a side view and a sectional end view on 10—10, Figure 9, showing a chain slipper in position.

In the form of sheet delivery apparatus illustrated by Figures 1 to 6, the conveyor is composed of two sections indicated by 9 and 10, hinged at their adjacent ends on a shaft 11.

The fore section 9 has two side frames 12 and 13 and the rear section 10 has two side frames 14 and 15.

The fore section 9 has a shaft 16 fitted with sprockets 17 and the rear section 10 has a shaft 18 fitted with sprockets 19. Endless chains 20 pass over the sprockets 17 and 19, suitable means being provided to guide and tension the chains, for instance, as shown in Figures 3, 9 and 10. Slippers 21 pivoted on studs 22 passing through slots 222 in the side frames 12 and 13 engage with the chains 20 and are adjusted in the slots 222 by adjusting screws 23.

The chains 20 are provided with sets of mechanical grippers 24 at regularly spaced inter-

vals. The grippers 24 are of known type, that is, they are in the form of plates carried by shafts 25, which are mounted to oscillate in bearings 26 carried by the gripper bars 27 with which the grippers 24 co-operate. The gripper shafts 25 have springs 28, which keep them closed until they are opened by cams 29 and 30 with which rollers 31 on trip levers 32 on the gripper shafts 25 engage as they pass around the fore and rear ends of the conveyor.

The cams 29 and 30 are fixed to the side frames 14 and 12, respectively, adjacent to the sprocket shafts 16 and 18. The shaft 11 is supported in brackets 33 fixed to the main framework 34 of the machine.

The fore section 9 of the conveyor is normally supported at its outer end on brackets 35, which carry the shaft 36 of the impression cylinder 37, the brackets being supported by the machine framework 34. Only one bracket 35 is indicated in Figure 1, and the impression cylinder 37 is only diagrammatically indicated, as its form including the grippers 38 thereon and the manner of driving it may be of conventional type.

The rear conveyor section 10 when lowered is supported at its outer part by means hereinafter described.

A piling table 40 is diagrammatically indicated in Figure 1, as it may be of conventional type.

The rear conveyor section 10 is shown in Figure 1, provided with a counterbalance weight 41 mounted on a shaft 42, which is provided with two levers 43 connected by links 44 to the conveyor side frames 14 and 15. This facilitates raising of the rear conveyor section 10 from the normal position, as indicated in full lines in Figure 1, to that indicated in dot-and-dash lines, the weight 41 when swung from its normal position being sufficient to hold the rear conveyor section in its raised position. Little manual effort is required to raise and lower the rear conveyor section. When the section 10 is lowered the levers 43 rest upon brackets 381 on the frame 34, which also carries the sheet feeding mechanism, which is not illustrated as it may be of conventional type, the feed or lay board being diagrammatically indicated at 39.

The fore conveyor section 9 being shorter can be raised manually from its normal position, shown in full lines in Figure 1, to the position indicated in dot-and-dash lines. It is locked in the raised position by a safety lock, best shown in Figures 3 and 4, comprising a latch 45 pivoted at 46 to the conveyor side frame 12 and having a notch 47 for engagement with a pin 48 on the conveyor side frame 14.

It has been suggested to make an endless band or apron type delivery conveyor in two hinged sections, but the problem is not the same. It is immaterial at what speed an apron type conveyor operates as it does not have to take hold of each sheet and pull it off the impression cylinder.

With an endless band or apron conveyor the sheet is removed by special devices so called "strippers" fixed in front of the cylinder below the conveyor. They merely place the sheet on the endless band and no strippers are used with an endless chain gripper type of conveyor, the grippers directly taking hold of the sheet while on the cylinder.

Consequently, an endless chain type having mechanical grippers must be driven at variable speeds, between the runs and sheet grippers thereon at the sprockets and travel on the

sprockets thereof, changing or increasing the speed of the conveyor to synchronize with the variable speed cylinder rotation so that as each set of mechanical grippers arrives at the cylinder, the grippers on the cylinder have arrived in position to release and present the edge of a sheet ready for withdrawal. The conveyor speed is also decreased to release and deposit each sheet smoothly and evenly on the pile.

Flat-bed printing machines vary considerably:

(*a*) Some have a constantly and/or variable speed rotating cylinder printing once for each revolution, others (*b*) have a stop-cylinder i. e. one which revolves and stops after each revolution, while others (*c*) have cylinders which make two revolutions per printing operation and rise and fall.

The invention has been particularly designed for the type (*a*) but is equally applicable to type (*b*).

In either case synchronization of conveyor and cylinder is necessary, that is, the mechanical grippers of the conveyor must arrive at the same time as the cylinder grippers arrive at the delivery position.

With types (*a*) and (*b*) the speed of the conveyor must also be synchronized with the speed of revolution of the cylinder while the printed sheet is being taken or gripped.

In order to meet both of these conditions the conveyor should not only be driven through gearing, preferably offset from the drive and pivot axis and variable or change speed gearing off the cylinder shaft to give effective synchronism or correct mutual time of arrival, but the speed of the conveyor must vary during removal of the sheet from the cylinder to suit the varying speed of the cylinder.

The ratio of gearing will take care of timing of conveyor and cylinder, but something more is required in the gearing to effect synchronization of speed of conveyor grippers and cylinder. Hence the provision of what is described in the specification as a variable speed gear.

When an endless chain conveyor fitted with mechanical grippers is provided on a printing press in which the impression cylinder is rotating during the removal of a sheet, the synchronization of the grippers on the conveyor with those on the impression cylinder, so far as mutual time of arrival is concerned, can be assured by appropriately determining the ratio of the gearing between the impression cylinder shaft and the driving sprockets of the conveyor or chains.

A difficulty arises because the abutment bars of the conveyor grippers must extend beyond the circumferences of the pitch circles of the driving sprockets in order that the outer surfaces of the bars may pass closely to the impression cylinder. Consequently, although the surfaces of the abutment bars are moving at the same speed as the chains when traveling along the straight runs or paths of the chains, the speed of the abutment surfaces is increased when the bars are moving round the sprockets with the chains. This is due to their greater distance from the centre rotation i. e. the axis of the sprocket. The speed of the bars drops again as they leave the sprockets.

With a rotating cylinder, for example, one moving at a non-uniform speed, as in the machine described in British specification No. 589,522 (U. S. Serial No. 653,068) now U. S. Pat-

ent No. 2,542,705, dated February 10, 1951, this variation in speed of the gripper abutment bars should be compensated for, as it is not only desirable, but necessary, for obvious reasons, that the printed sheet should be transferred from the impression cylinder grippers to the chain grippers while both sets of grippers are moving at the same speed. For this purpose a speed varying gear is introduced in the driving gear between the impression cylinder shaft and that of the sprockets driving the gripper chains. Such a speed varying gear also ensures that the gripper chains are decelerated when a printed sheet is deposited on the delivery pile.

In the example above described, the conveyor chains **20** are driven so that the grippers **24** are brought to and from the impression cylinder in proper sequence or synchronism with the cylinder grippers **38** by the following mechanism:

A bevel wheel **49** on the shaft **36** of the impression cylinder **37** meshes with a bevel pinion **50** on a shaft **51** which has a bevel pinion **52** meshing with a bevel wheel **53**, as shown in Figures 2 and 4. The wheel **53** is fixed on a stub shaft **54** mounted to rotate in a bearing **55** on a bracket **56** fixed to the adjacent upright bracket **33**, as shown in Figure 5.

A bevel wheel **57**, Figures 4 and 5, free to rotate on the shaft **11** meshes with a bevel pinion **58** on a shaft **59** having a bevel pinion **60** meshing with a bevel wheel **61** fixed on the sprocket shaft **16**.

A collar **62** capable of sliding on the stub shaft **54** has an arm **63** provided with a driving pin **64** passing through a hole **65** in the bevel wheel **53** and adapted, normally, to engage with a lug **66** on the bevel wheel **57**. The collar is moved by a yoke **67** to bring the driving pin into and out of driving engagement with the lug **66**. The yoke **67** is on one arm of a bell-crank lever **68** which is pivoted at **69**, the other arm of the lever having a rounded end **70** which, when the conveyor sections **9** and **10** are in their normal positions, is situated in depressions **71** and **72** of two cams **73** and **74** fixed to the adjacent side frames **13** and **15** of the conveyor sections, as shown in Figures 5 and 6. The bell-crank lever **68** is held in the normal position by a spring **681**. Consequently, when the impression cylinder is rotated, the bevel wheel **53** is rotated and the driving pin **64** engaging with the lug **66** rotates the bevel wheel **57**, so that the sprocket shaft **16** is rotated to drive the conveyor chains **20**. The driving pin **64** may be provided with an anti-friction roller for engagement with the lug. Instead of the driving pin **64** or its roller, if provided, engaging with a lug, it may engage in a slot in the bevel wheel **57**.

Should either of the conveyor sections **9** and **10** be raised, its respective cam **73** or **74** raises the rounded end **70** of the bell-crank lever **68**, this lever, rocking about its pivot **69**, sliding the collar **62** to withdraw the driving pin **64** from the lug **66** so that the wheel **57** ceases to rotate. Consequently the conveyor chains **20** remain inoperative so long as either conveyor section is in the raised position.

If only one of the conveyor sections **9** and **10** has been raised, the mere lowering of that section to its normal position will be sufficient, by means of its cam **73** or **74**, to effect automatic re-engagement of the driving pin **64** with the lug **66**, so that the conveyor chains will again be

driven, but if both conveyor sections **9** and **10** have been raised, it will be necessary to lower both of them to effect the resumption of the drive.

When the impression cylinder is rotating during the removal of a sheet by the conveyor grippers, especially if the speed of the impression cylinder is not uniform, for instance as in the machine described in the specification of application for patent Serial No. 653,068 filed March 8, 1946, now U. S. Patent No. 2,542,705, dated February 10, 1951, a variable speed mechanism is provided to synchronise the sheet delivery conveyor with the cylinder that is, not only to ensure that the arrival of the grippers **24** and their gripper bars **27** coincides with that of the grippers **38** on the impression cylinder **37** at the moment of taking a sheet from the cylinder, but also that the rate and speed of the outer or gripping surfaces of the bars **27** at that time are equal to that of the cylinder. Each gripper bar **27** extends beyond the pitch circles of the sprockets **17** as the chains carry it around the sprockets so that the gripping surfaces are moving on arcs of greater radius than that of the pitch circles and consequently their speed is momentarily increased, falling again rather abruptly as the bars are carried off the spocket.

In a simple form, as illustrated by Figures 4 and 5, this is provided by arranging that the clutch driving pin **64** rotates about a centre off-set from that about which the lug **66** rotates, so that a relative sliding movement between the pin **64** and the lug **66** can occur during each rotation. For this purpose, the stub staft **54** of the bevel wheel **53** is off-set relatively to the shaft **11** on which the bevel wheel **57** rotates.

Joggers are provided for engaging with the side edges of the sheets delivered by the conveyor grippers on the piling table **40**, so as to straighten the sheets as they are piled.

The joggers are in the form of light metal plates **75** and **75'**, Figures 1 and 4. One plate **75'** is fixed on a rod **76** of a piston sliding in a small pneumatic cylinder **77**.

The cylinder **77** is pivotally connected at **78** to a lever **79'**. The other plate **75** is merely pivotally mounted on levers **79** and **79'**. The levers **79** are pivoted at **80** and **80'** to the adjacent side frames **14** or **15**, each pivot **80**, **80'** having a thumb nut **81** to fix the lever in its adjusted position.

The cylinder **77**, has a pipe **85** connecting it to any convenient suction or compressed air device on the machine, which will cause the piston to reciprocate.

Most modern printing machines employ such suction or air compressing devices for operating parts of the machine, so that no illustration is necessary.

A jogger for the rear edges of the sheets may be provided in the form of a light steel plate **82** fixed on the rod of a piston sliding in a pneumatic cylinder **83** supported on an adjustable cross stay **84**, slidably mounted on the side frames **14** and **15**.

The cylinder **83** has a pipe **85** similarly to the cylinder **77**.

The pneumatically operated joggers avoid injury to the hands of the machine operator should they be caught inadvertently between the plates **75**, **75'** or **62** and the pile of sheets on the piling table.

An alternative form of variable speed drive for the conveyor from the shaft of the impression cylinder is shown in Figures 7 and 8.

The shaft **36** of the impression cylinder **37** is

provided with a gear wheel 86 which meshes with the usual reciprocating rack 186.

It also has a gear wheel 187 (Figure 8) which forms part of a train of gears for rotating the impression cylinder when it is not in engagement with the rack, which train of gears is not shown as it forms no part of this invention. This train of gears may be a variable speed train as disclosed in the aforementioned Patent No. 2,542,705.

The shaft 36 is further provided with a gear wheel 87, which is mounted eccentrically on the shaft. The gear wheel 87 drives a gear wheel 88 through two intermediate gear wheels 90 and 91.

The gear wheel 88 is fixed on a short shaft 92 mounted to rotate in a bearing 93 carried by a bracket 94 fixed to the bearing bracket 35 on the framework 34 of the machine, this bracket 94, the drive gear 187 and the framework being omitted in Figure 7 for the sake of clearness.

A swinging frame 95, pivoted on a bearing bush 921 of the shaft 92, carries the gear wheels 90 and 91. A connecting rod 96 is pivotally attached at one end 97 to the lower end of the swinging frame 95, and at the other end to a pin 98 which is fixed in the end of the shaft 36 eccentrically to the centre line thereof, but concentric or co-axial with the gear wheel 87. The swinging of the connecting rod 96 by the eccentric pin 98 causes the pinion 90 to oscillate or roll to and fro on the wheel 87 as indicated by the arrows 114 and 115, Figure 7, which results in a slight retardation and acceleration in the speed of the chain driving sprockets 17 to compensate for the slight momentary increase of speed of the outer surfaces of the chain gripper abutment bars when passing around said sprockets as hereinbefore described. Another advantage of varying the speed of the conveyor is that as each sheet is deposited on the piling table its speed and therefore its momentum is decreased so that it is deposited smoothly and evenly on the pile.

A manually operated clutch is provided between the short shaft 92 and the sprocket shaft 16 of the fore section 9 of the conveyor. This clutch comprises a disc 99 fixed on the shaft 92 and having holes 112 for the reception of driving pins 100 on a disc 101, which is splined to the sprocket shaft 16, but is free to slide thereon. The disc 101 has a collar 102. A pin 103 on a lever 104 engages with the collar 102. The lever 104 is pivoted at 105 and is pivotally connected by a pin 106 to an operating rod 107 provided with a handle 108. The rod 107 can be rotated in the pin 106. It has a catch 109 fixed on it. When the rod 107 is rotated the catch 109 is also rotated into and out of engagement with a stop 110 fixed on the frame 12. When the handle 108 is pushed inwards against the action of a return spring 111, the lever 104 is rocked by the rod 107 to slide the disc 101 and its driving pins 100 away from the disc 99, so that the driving clutch is disengaged.

By a partial rotation of the handle, the catch 109 is engaged with the stop 110 so that the clutch is retained in its disengaged condition.

When the clutch is to be re-engaged, the handle 108 is rotated in the opposite direction to release the catch 109 from the stop 110, whereupon the spring 111 slides the rod 107 outwardly, so that the lever 104 slides the disc 101 towards the disc 99. Immediately the holes 112 in the disc 99 are in registration with the pins 100, the spring 111 completes the sliding movement of the disc 101 and the pins enter the holes and driving starts.

I claim:

1. A flat-bed printing machine comprising an impression cylinder continuously rotatable at a variable speed, a piling table, an endless chain conveyor for delivering printed sheets from the impression cylinder to the piling table, said endless chain conveyor being composed of two sections hinged at their adjacent ends for permitting either section to be raised and lowered as required, means for driving one of the sprocket shafts of the conveyor from the shaft of the impression cylinder, said driving means including a variable speed gear for synchronizing the speed of the conveyor with that of the impression cylinder, said driving means also including a clutch, and means for controlling said clutch to effect the engagement and disengagement of said driving means when either of said conveyor sections are respectively lowered or raised.

2. A flat-bed printing machine as specified in claim 1, having a short shaft mounted partly co-axially with the forward sprocket shaft of the conveyor, a clutch interposed between said shafts, and eccentric driving means between the shafts to cause increase in the speed of the chain conveyor adjacent the cylinder, comprising a gear wheel on said short shaft, a gear wheel eccentrically mounted on the shaft of the impression cylinder, a train of intermediate gear wheels between said eccentric gear wheel and the said gear wheel on the short shaft, a swinging frame for carrying said intermediate gear wheels, said frame being pivotally mounted to swing about the axis of said short shaft, a driving pin mounted eccentrically on the shaft of the impression cylinder, but co-axially with the gear wheel thereon and a link pivotally connected at one end with said driving pin and at the other end with said frame.

3. A flat-bed printing machine as specified in claim 1 wherein one of said sections is longer than the other, counterweighted leverage means connected to said longer section for facilitating raising thereof and supported in lowered positon, and releasable means on the shorter section cooperative with means on said longer section to hold the shorter section in raised position.

4. A sheet delivery apparatus for printing machines of the class described comprising a rotatable impression cylinder having sheet grippers, means for rotating the cylinder, a piling table, an endless chain conveyor for delivering printed sheets from the impression cylinder to the piling table, releasable sheet grippers on the cylinder and conveyor respectively, said conveyor comprising two frame sections pivoted to swing up and down on a common hinge axis and chains trained around sprockets journaled at the opposite outer end portions of said frame sections, and speed change gear for driving said conveyor from the cylinder through said hinge axis to compensate for variations in the speeds of the cylinder and conveyor and of the respective grippers thereof in the take-off position so that the conveyor grippers will engage the printed sheets when released by the cylinder grippers, said speed change gear conveyor driving means including cooperating driving connections concentric and eccentric, respectively, to said hinge axis, whereby the conveyor chains and cylinder are driven at such relative variable

speeds as to bring and actuate the respective grippers thereof to open and closed positions relatively in proper sequence in the holding and take-off positions, said speed change gear conveyor driving means also including releasably engageable drive mechanism for disengaging said conveyor driving means when either of said conveyor frame sections are raised and engaging said driving means when both of said conveyor frame sections are lowered, said releasably engageable drive mechanism being cooperative with said concentric and eccentric driving connections, whereby the conveyor driving means is disengageable and engageable between said concentric and eccentric connections, and means operable by said frame sections for actuating said releasably engageable drive mechanism to engage or disengage said driving means upon movement of said frame sections.

5. A sheet delivery apparatus for printing machines of the class described comprising a rotatable impression cylinder having sheet grippers, means for rotating the cylinder, a piling table, an endless chain conveyor for delivering printed sheets from the impression cylinder to the piling table, releasable sheet grippers on the cylinder and conveyor respectively, said conveyor comprising two frame sections pivoted to swing up and down on a common hinge axis and means for driving the conveyor from the cylinder and including releasably engageable drive mechanism for disengaging said conveyor driving means when either of said conveyor frame sections is raised and engaging said driving means when both of said conveyor sections are lowered, said conveyor driving means comprising speed change gear for driving said conveyor from the cylinder through said hinge axis to compensate for variations in the speeds of the cylinder and conveyor and including cooperating driving connections concentric and eccentric, respectively, to said hinge axis, whereby the conveyor chains and cylinder are driven at such relative variable speeds as to bring and actuate the respective grippers thereof to open and closed positions relatively in proper sequence in the holding and take-off positions.

6. A flat-bed printing machine comprising a rotatable impression cylinder having sheet grippers, a piling table, an endless chain conveyor having grippers for delivering printed sheets from said impression cylinder to said piling table, said conveyor being supported by a pivotally mounted frame for permitting the raising and lowering thereof from and to operative position, means for driving said conveyor in synchronism with said cylinder and including releasably engageable drive mechanism operative to effect engagement or disengagement of said driving means when said conveyor frame is respectively lowered or raised, said driving means including means for synchronizing the relative positions of said conveyor grippers with said cylinder grippers upon engagement of said drive mechanism.

7. A flat-bed printing machine comprising a rotatable impression cylinder having sheet grippers, a piling table, an endless chain conveyor having grippers for delivering printed sheets from said impression cylinder to said piling table, said conveyor being supported by a pivotally mounted frame for permitting the raising and lowering thereof from and to operative position, means for driving said conveyor in synchronism with said cylinder and including clutch means, and means controlling said clutch to effect engagement or disengagement of said driving means when said conveyor frame is respectively lowered or raised, said clutch means including cooperative rotatable members which are drivingly engageable at a selected relative angle of rotation for synchronizing the relative positions of said conveyor grippers with said cylinder grippers upon engagement of said clutch means.

8. A flat-bed printing machine comprising a rotatable impression cylinder, a piling table, an endless chain conveyor for delivering printed sheets from said impression cylinder to said piling table, said conveyor including two pivotally mounted frame sections for permitting the respective raising and lowering thereof from and to operative position, means for driving said conveyor in synchronism with said cylinder and including clutch means, and means controlling said clutch means and operative by said frame sections to effect disengagement of said driving means when either of said conveyor frame sections is raised and to effect engagement of said driving means only when both of said conveyor frame sections are lowered.

9. A flat-bed printing machine comprising a rotatable impression cylinder having sheet grippers, a piling table, an endless chain conveyor having grippers for delivering printed sheets from said impression cylinder to said piling table, said conveyor including two pivotally mounted frame sections for permitting the respective raising and lowering thereof from and to operative position, means for driving said conveyor in synchronism with said cylinder and including clutch means, and means controlling said clutch means and operative by said frame sections to effect disengagement of said driving means when either of said conveyor frame sections is raised and to effect engagement of said driving means only when both of said conveyor frame sections are lowered, said clutch means including cooperative rotatable members which are drivingly engageable at a selected relative angle of rotation for synchronizing the relative positions of said conveyor grippers with said cylinder grippers upon engagement of said clutch means.

ARTHUR WILLARD RANGER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
815,008	Davidson	Mar. 13, 1906
1,494,339	Clauberg	May 20, 1924
1,600,936	Eddelman	Sept. 21, 1926
1,645,993	Kelly	Oct. 18, 1927
1,694,499	Carlton	Dec. 11, 1928
1,979,253	Coy	Nov. 6, 1934
2,226,674	Seybold	Dec. 31, 1940
2,250,657	Seybold	July 29, 1941

FOREIGN PATENTS

Number	Country	Date
284,845	Great Britain	Feb. 9, 1928
327,975	Great Britain	Apr. 14, 1930
383,243	Great Britain	Nov. 10, 1932
485,239	Great Britain	May 17, 1938