April 17, 1928.

A. W. RANGER

1,666,246

SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 1

Fig. 3.

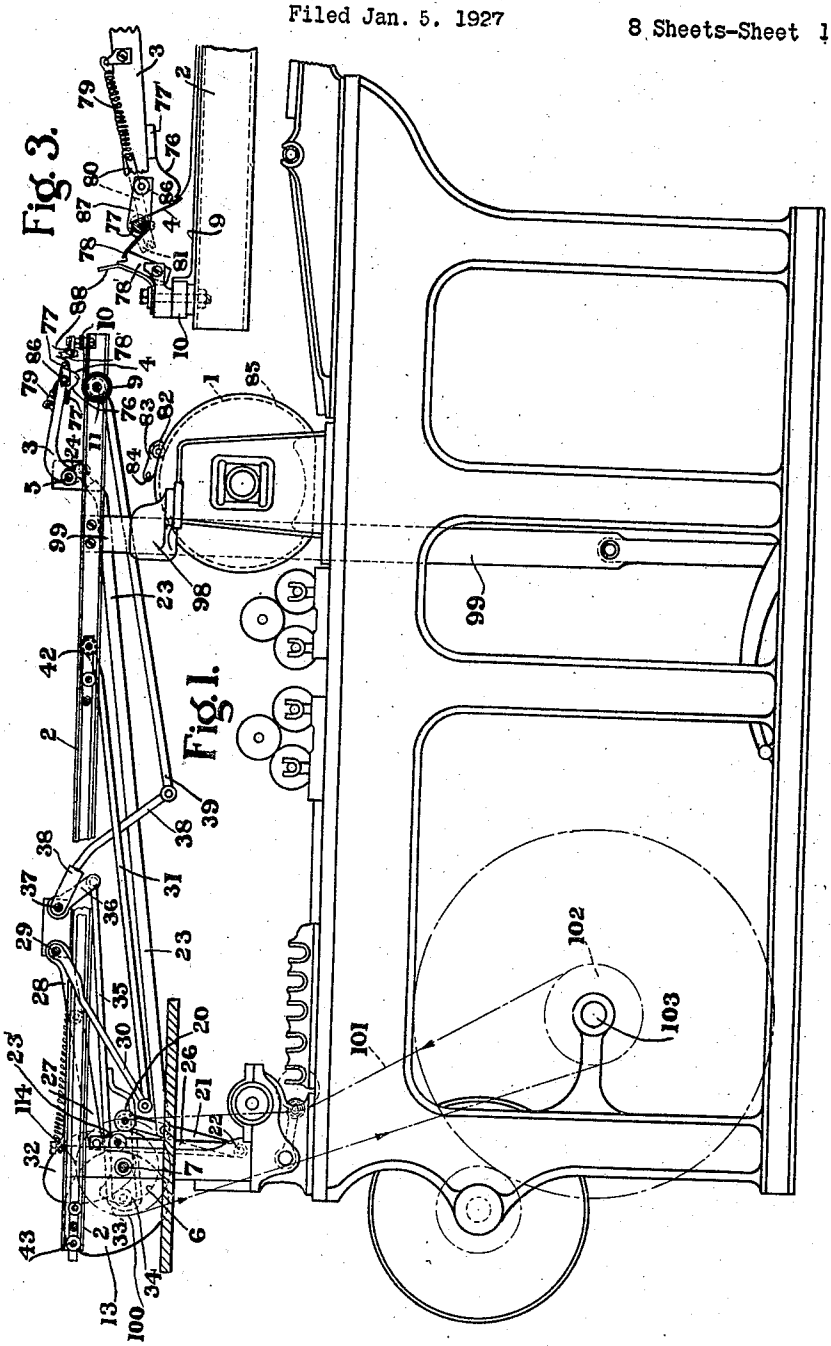


Fig. 1.

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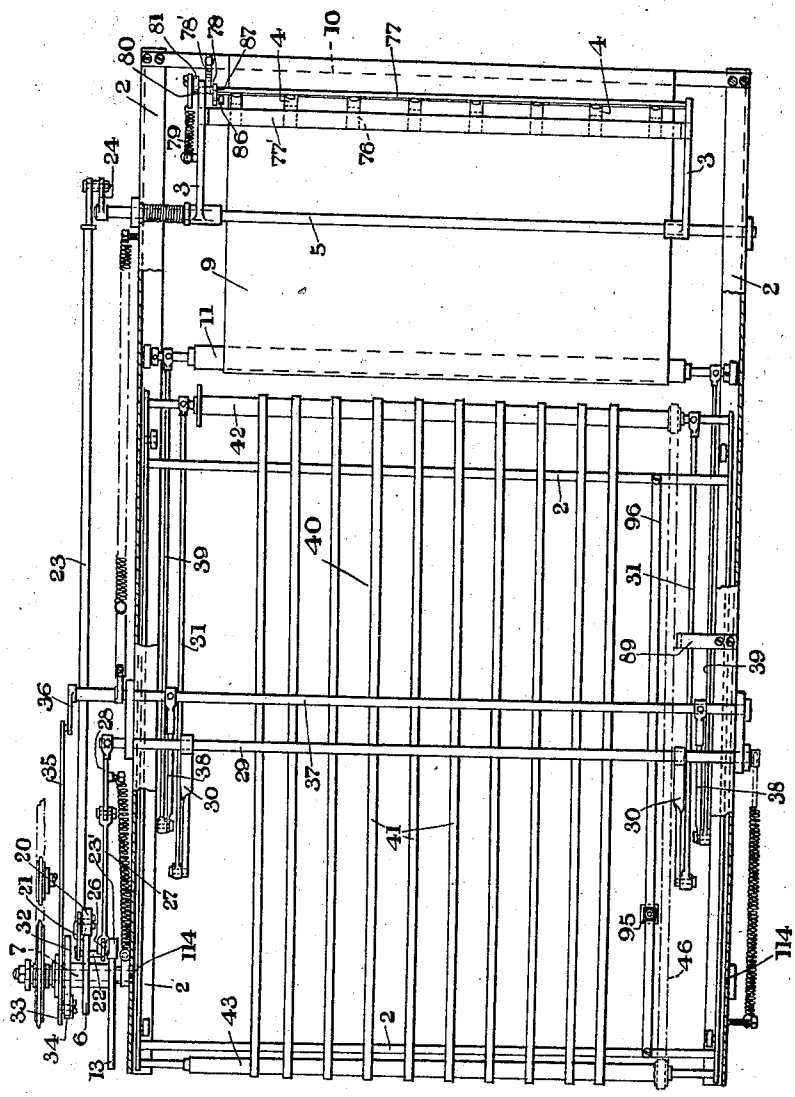
1,666,246

SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 2

Fig. 2.



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SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 3

Fig.4.

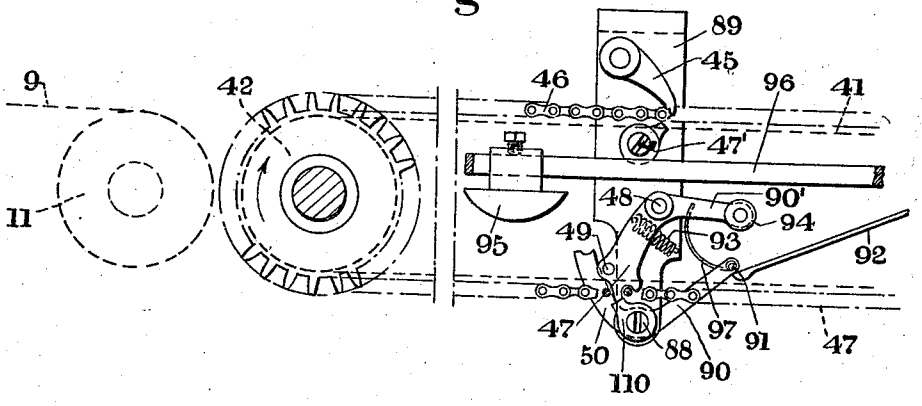
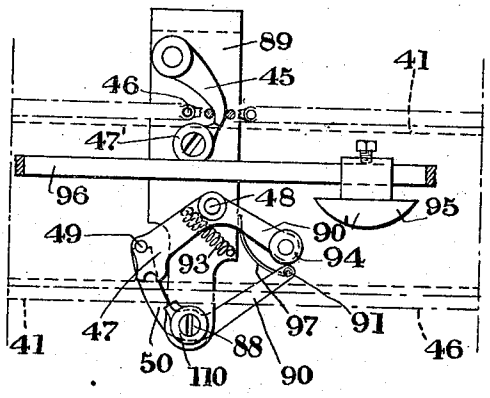


Fig.5.



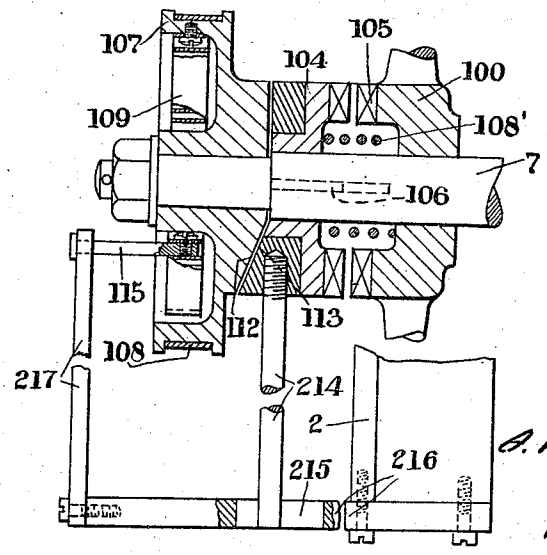


Fig.14.

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1,666,246

SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 4

Fig.6.

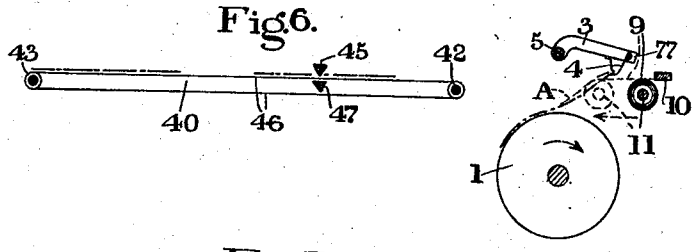


Fig.7.

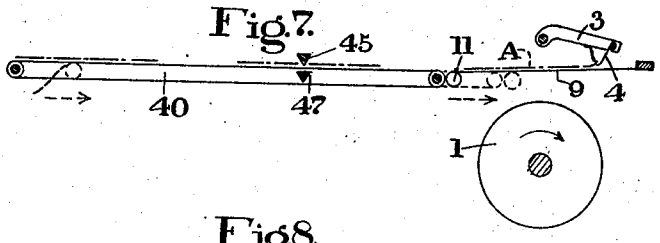


Fig.8.

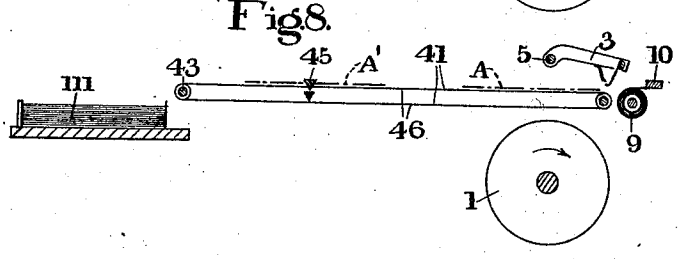


Fig.9.

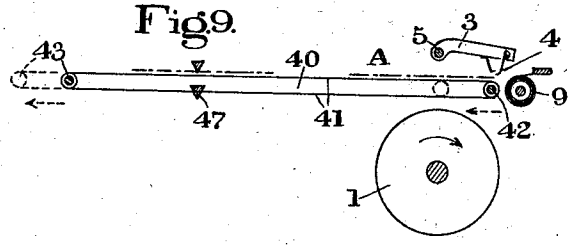
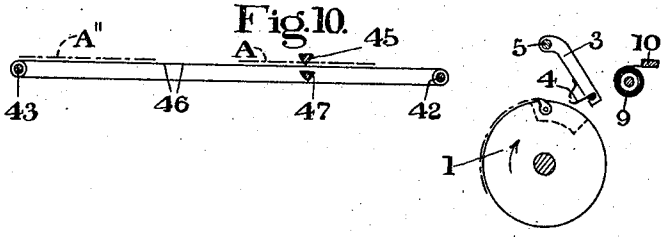


Fig.10.



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SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 5

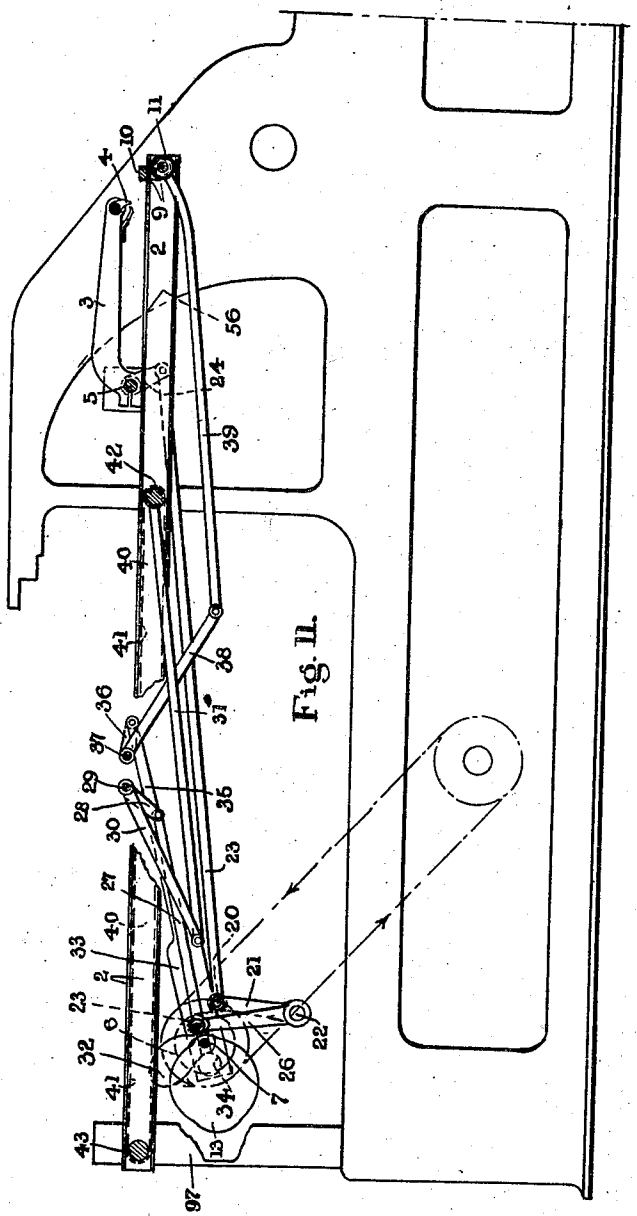


Fig. 11.

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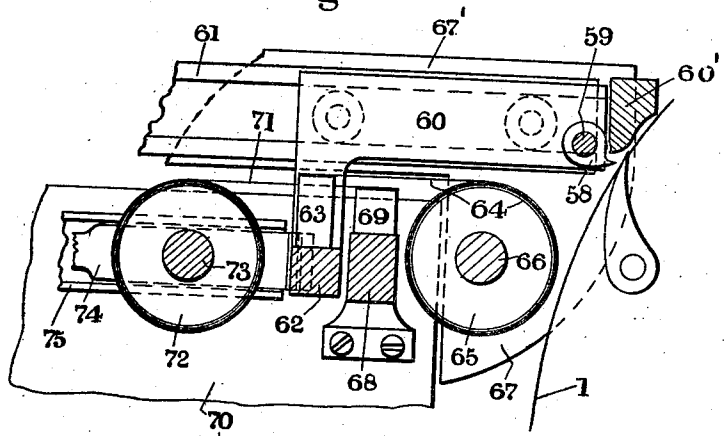
1,666,246

SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 6

Fig.12.



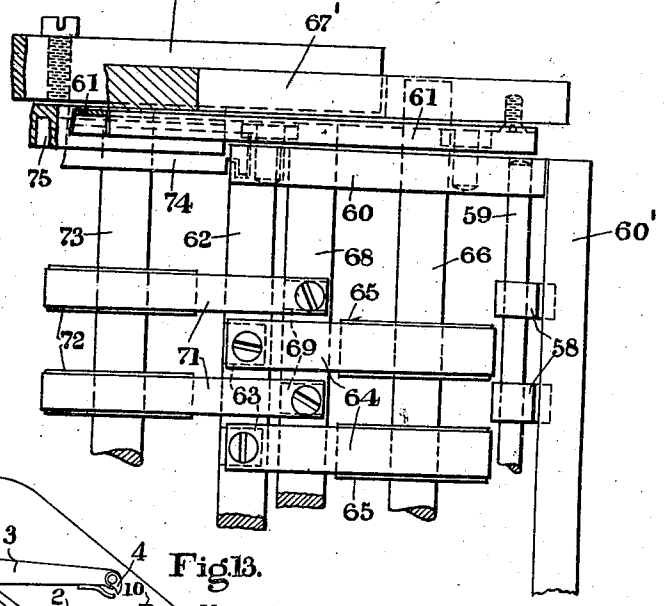


Fig.11a

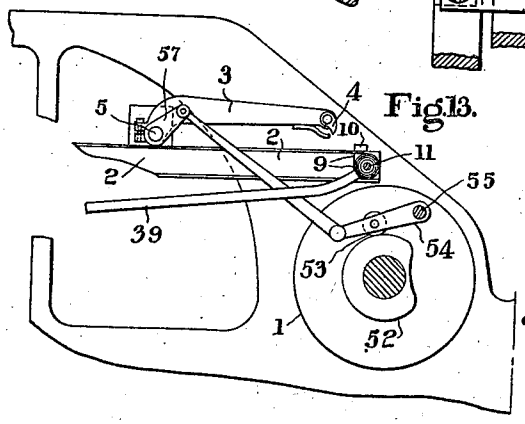


Fig.13.

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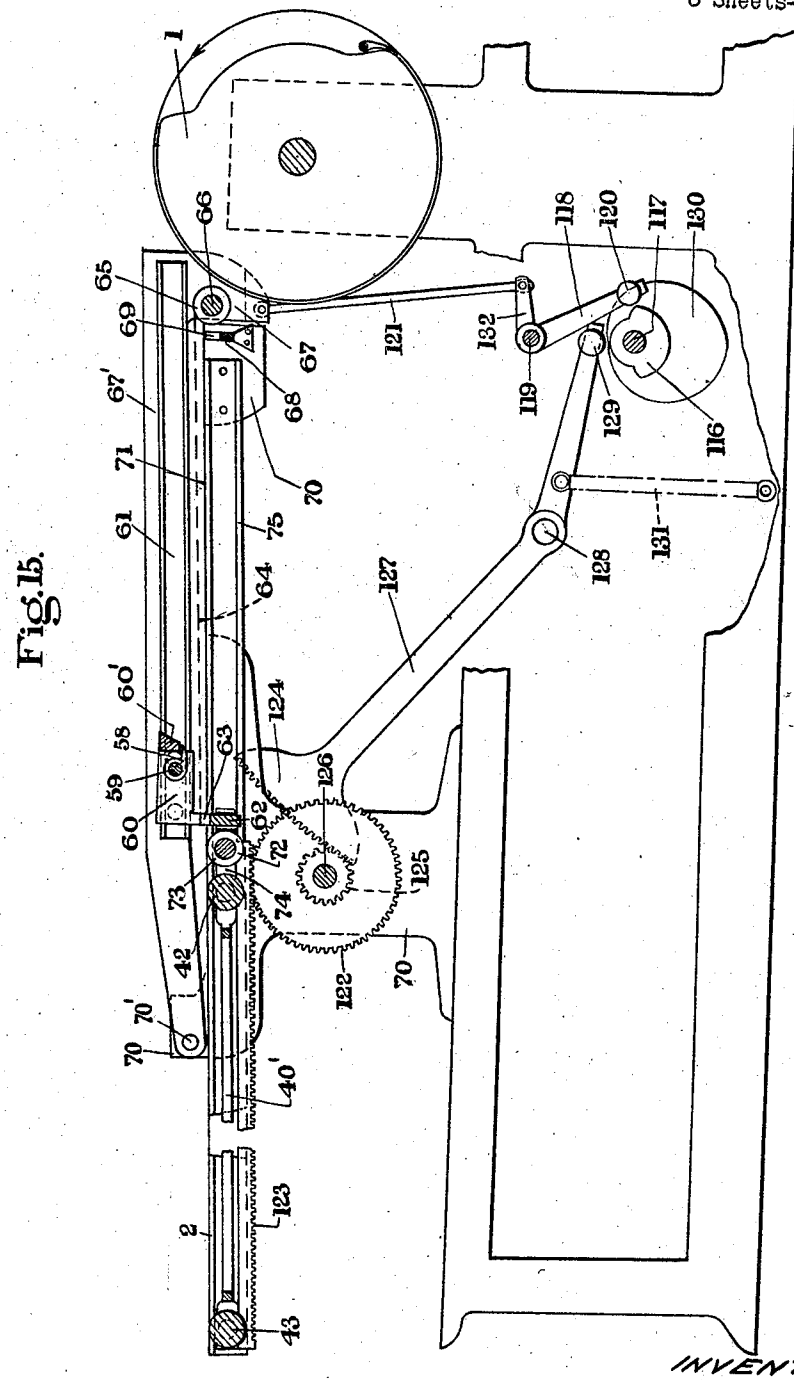
1,666,246

SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 7

Fig.15.



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SHEET DELIVERY APPARATUS FOR USE ON PRINTING MACHINES

Filed Jan. 5, 1927

8 Sheets-Sheet 8

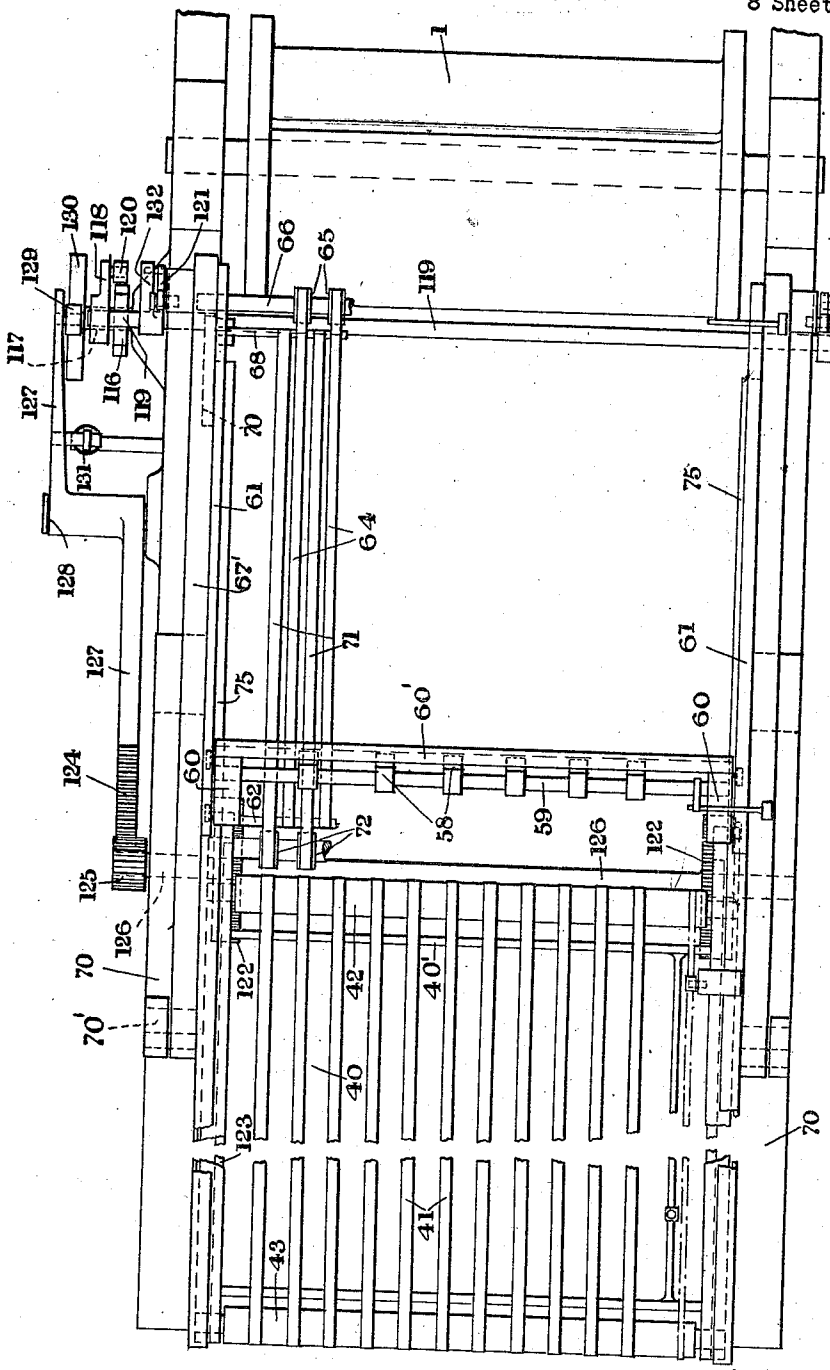


Fig.16.

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Patented Apr. 17, 1928. 1,666,246

UNITED STATES PATENT OFFICE.

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SHEET-DELIVERY APPARATUS FOR USE ON PRINTING MACHINES.

Application filed January 5, 1927, Serial No. 159,197, and in Great Britain January 8, 1926.

In printing presses having impression cylinders (for example flat bed machines) or blanket cylinders (off-set machines) and whether these machines have either stop cylinders or continuously rotating cylinders, there has been a long felt demand for a sheet delivery apparatus which will operate without any rubbing contact or relative contact movement between either side of the sheet and fixed or moving parts of the apparatus likely to cause smutting or smearing; and, moreover, which will also allow the freshly printed surface of the sheet to be exposed long enough to allow the ink to set or partially dry.

In spite of very many suggestions and attempts in practice to meet these requirements no satisfactory solution has hitherto been found even though known proposals have been made to take off the sheets from the impression cylinder by rotary grippers so that the sheet is suspended and subsequently transferred by intermediary mechanism to the piling table.

The object of the present invention is to overcome these difficulties and moreover the invention also has additional advantages in its application to certain machines, for example flat bed machines, in that it avoids loss of time in "making ready", it permits of free access to the type form in a two-revolution machine. It enables the sheets to be delivered on to a pile convenient for inspection by the machine minder, and if desired to a position beyond the end of the machine frame so that an automatic pile lowering device of known kind may be used.

It further avoids the use of flyer drums and flyer sticks and their attendant disadvantages.

In the apparatus according to the invention the grippers are adapted to take off the sheet from the cylinder (impression cylinder or blanket cylinder as the case may be) without making rubbing contact with any part, and a support in the form of a roller blind or apron is adapted to receive the sheet by unrolling below the sheet so as to avoid rubbing contact (i. e. without relative sliding motion between support and sheet) and a reciprocatory tape-carrier is adapted to co-operate with said support so that said support rolls up and relinquishes the sheet at the same time that the tapes of the carrier travel relatively to their rollers to receive the sheet without rubbing contact (or relative sliding motion) between the sheet and the tapes, said carrier being adapted by subsequent reciprocation to discharge the sheet to the piling table.

The tape carrier moreover is preferably adapted to effect a plurality of strokes before discharging each sheet on to the pile whereby the freshly printed surface of each sheet is exposed to the action of the air sufficiently to effect setting or partial drying of the ink before the sheet is deposited on the pile.

Further, means are provided to enable the operation of the tapes of the reciprocatory carrier to be regulated to suit different sizes of sheet.

In the accompanying drawings:—

Figure 1 is a side sectional elevation and Figure 2 is a plan illustrating one form of the invention applied to a flat-bed stop cylinder or wharfedale machine.

Figure 3 is a side view of gripper mechanism on a larger scale.

Figures 4 and 5 are side elevations illustrating mechanism for controlling the travel of the tapes or the like of the reciprocatory carrier.

Figures 6 to 10 are diagrams illustrating successive steps in the operation of the delivery mechanism shown in Figures 1 and 2.

Figure 11 is a side sectional elevation illustrating an application of the invention to a flat-bed stop cylinder machine of the continental or over feed type.

Figure 11[a] is a side view of an alternative form of driving mechanism for the grippers.

Figures 12 and 13 are, respectively, a side sectional elevation and a plan illustrating the principal parts of another form of the invention suitable for application to a two-revolution cylinder machine, either flat-bed or off-set.

Figure 14 is a sectional elevation illustrating mechanism for automatically disengaging the driving gear when the delivery apparatus is raised for "making ready".

Figures 15 and 16 are, respectively, a side sectional elevation and a plan of the form of the invention shown in Figures 12 and 13 applied to a two-revolution machine, only sufficient parts of the machine being indicated to render the description clear.

Referring to Figures 1 and 2, 1 represents the impression cylinder, 2 is the frame of the

delivery apparatus, the side members of which are channelled sections to act as guides for the reciprocatory carrier and the roller of the apron support. Two levers 3, one on each side of the frame, are provided with a cross bar 77 fitted with grippers 4. The levers 3 are mounted on a cross-shaft 5 which is carried in bearings on the frame 2. The shaft 5 is oscillated by a cam 6 on a cam shaft 7. The cam 6 engages with a roller 20 on a rocking lever 21 which is pivoted at 22 and is connected by a rod 23 to a crank 24 on the shaft 5.

The grippers 4 may be of any suitable construction well known in the art, for instance, as shown they may comprise spring steel fingers co-operating with similar fingers 76 (Figure 3) secured to a bar 77′ fixed on the levers 3.

When the levers 3 are moved down to the impression cylinder 1 a spring pawl 78, fixed to the bar 77, slides off the end of a pivoted latch block 78′ so that the bar 77 is partly rotated to open the grippers. The grippers snap into and are held in the open position by a spring 79 which is secured at one end to one of the levers 3 and at the other end to a rod 80 pivotally connected to a crank 81 on the bar 77. When the rod 80 moves over the axis of the bar, namely to one side or other of the dead centre of the crank 81, the spring tends to pull and to hold the crank to that side.

The open grippers thus descend ready to grip a sheet on the impression cylinder, entering the usual gap therein. A roller 82 on a lever 83, pivoted at 84 to a suitable support, runs on a cam track 85 in the cylinder 1.

When a sheet has entered the open grippers, the lever 83 is raised, and engaging with a roller 86 on a crank 87 on the bar 77, partly rotates the bar, so that the grippers close with a snap on to the paper sheet under the action of the spring 79. The levers 3 then rise and carry the sheet away from the cylinder 1. The spring pawl 78 slides past the latch block 78′ which yields against the action of a spring 88 and allows the pawl 78 to pass into engagement with its upper end without opening the grippers so that the sheet is held until the levers 3 start to descend again.

When the sheet has been so raised and is held suspended by the grippers (Figure 6) a support or apron of the known roller blind type, comprising for instance tapes or an apron 9 secured to a bar 10 (Figures 1 and 2) and wound on a roller 11, moves forward so that the roller 11 meets the underside of the suspended sheet, the bar 10, being, if desired, mounted to slide rearwardly as hereinafter described and for the purpose set forth in connection with Figure 11. The apron 9, however, is at this instant unwrapping so that it is unrolled, or laid out as it were, horizontally below the sheet which is deposited upon it without any relative sliding movement between it and the sheet, whereby rubbing of the underside of the sheet (and therefore of the previous printing in the case of perfecting) is avoided.

The transfer of the sheet may be effected in this example, in the same or a similar manner to that described in connection with Figure 11.

The roller 11 is reciprocated by any suitable means for example by a cam 32 on the cam shaft 7 engaging with a roller 34 on a slotted slide 33 sliding on the shaft 7 and connected by a rod 35 to a lever 36 on a shaft 37. Levers 38 on the shaft 37 are connected by rods 39 to the ends of the blind roller 11. The several stages in these operations are indicated in Figures 6 to 10 hereinafter more particularly referred to.

A reciprocatory endless tape carrier 40 comprising tapes 41 and rollers 42 and 43 mounted in a frame 40′ is reciprocated by a cam 13 acting on a roller 23′ on a rocking lever 26 which is pivoted at 22 and is connected by a rod 27 to a lever 28 on a shaft 29. Levers 30 on the two ends of the shaft 29 are connected by rods 31 to the ends of the tape roller 42.

Means are provided to effect a travelling motion of the tapes 41 over the rollers 42, 43, under certain conditions when the endless tape carrier is reciprocated. Suitable means are indicated in Figures 4 and 5.

Two sprockets mounted on the ends of the rollers 42, 43, are connected by an endless chain 46. A detent 45 pivoted on a stationary support 89 engages with the chain. When the carrier moves in a direction away from the impression cylinder, namely, during the outward stroke, the detent 45 slips on the chain 46 and so far as this detent 45 is concerned no travelling motion is imparted to the tapes 41 over their rollers 42, 43. On the inward stroke of the carrier the detent 45 penetrates a link in the chain until arrested by a stop 47′ and this holds the chain so that the rollers 42, 43, are rotated to travel the tapes 41.

As explained hereinafter, for sheets of a certain size the travel of the tapes 41 effected by the detent 45 may be sufficient and the tapes do not travel over their rollers during the outward stroke of the carrier, but with narrow sheets it may be necessary to provide for additional travel and this is effected by auxiliary means such as a detent 47 pivoted at 48 on the stationary support 89 and adapted under certain conditions to engage with the lower strand of the chain 46 during part of the outward stroke of the carrier. The detent 47 has a pin 49 for engagement with the upper end of a latch 50 which holds the detent in an inoperative position. The latch 50 is pivoted at 88 on the stationary part 89

and has an arm 90 provided with a pin 91 which, just as the carrier approaches the end of its inward stroke is struck by a spring plate 92 carried by one of the levers 30 and so trips or releases the detent 47 which is drawn by its spring 93 into engagement with the chain 46 being arrested by a stop 110.

An extension 90′ of the detent carries a roller 94 which, on the outward stroke of the carrier is struck by a tappet 95 adjustably secured to a rod 96 fixed on the carrier. By these means the detent 47 is disengaged from the chain 46 and its pin 49 brought into position for engagement with the latch 50 which, in the meantime, has returned to its operative position under the action of a spring 97 as the spring plate 92 receded, so that the detent 47 is held by the latch out of engagement with the chain for the remainder of the outward stroke of the carrier.

The position of the tappet 95 on the rod 96 is determined by the amount of additional travel required for the tapes to compensate for the width of the sheets to be delivered at any time.

The details of the particular form of apparatus under consideration having been described the general operation will be understood from the following description with reference to the diagrams Figures 6 to 10, in which, by way of example, it is assumed that the auxiliary detent 47 is operating to compensate for the size of sheet which is being delivered.

In Figure 6 a sheet A is indicated in a suspended position, the apron 9 is shown in full lines in its fully wound up position ready to advance towards the sheet and the reciprocatory carrier 40 is shown in its extreme outward position.

Both detents 45, 47, are inoperative. The apron roller 11 then advances towards the sheet as indicated in dotted lines until the apron 9 is fully unwound or unrolled under the sheet which is deposited upon it as indicated in full lines in Figure 7. The carrier and the apron roller then move inwards as indicated in dotted lines in Figure 7, the detent 45 engages with the chain 46 and the sheet in due course being released by the grippers. During this operation the sheet is gradually relinquished by the apron 9 and is received upon tapes 41 of the carrier 40, the apron winding on its roller away from the underside of the sheet and the tapes 41 travelling over their rollers so that they are, as it were, laid against the underside of the sheet, on relative sliding motion or rubbing action occuring between the sheet and the apron or tapes.

When the parts have reached the positions indicated in full lines in Figure 8 the sheet A is fully deposited on the carrier tapes 41 and the carrier then begins to move outwards and the auxiliary detent 47 becomes operative as indicated in Figure 9, so that as the carrier continues to move outwards the sheet is not only carried by it but the tapes 41 are given a slight travel over their rollers due to the engagement of the auxiliary detent 47 during part of the initial movement of the carrier, and the sheet is also advanced on the carrier and at the end of the outward stroke thereof is in the position indicated in Figure 10. On the next inward stroke of the carrier the sheet will be advanced along the carrier to the position indicated at A′, Figure 8. At the end of the following outward stroke it will have reached the position indicated at A^2 Figure 10, and during the ensuing inward stroke will be delivered on the pile 111 (Figure 8) the sheet moving off the travelling tapes without relative sliding or rubbing action.

Each sheet is thus taken from the impression cylinder and deposited on the pile without sliding or rubbing against any fixed part and moreover it is reciprocated with the carrier for several strokes so that the ink has time to set.

In Figure 11 which indicates the application of the invention to a flat-bed stop-cylinder machine of the continental or over feed type, the parts corresponding to those hereinbefore described are indicated by similar reference numerals, there being no substantial difference in the construction of the delivery apparatus except that it has to be set farther back and lower relatively to the impression cylinder in order to clear the underside of the overhead feed board.

An alternative form of mechanism for oscillating the gripper levers 3 especially suitable for high speed work is indicated in Figure 11^a and comprises a cam 52 on the shaft of the impression cylinder 1 engaging with a roller 53 on a lever 54 which is pivoted at 55 and is connected by a rod 56 to a lever 57 on the shaft 5 on which the levers 3 are mounted.

The levers 3 are preferably arranged to move downwardly to such an extent that the grippers 4 are able to grip and move upwards momentarily with the sheet while it is still held by the cylinder grippers, both sets of grippers moving at the same speed.

Any usual tape or other device known in the art can be used at the rear and bottom of the impression cylinder 1 to prevent the tail end of large sheets from falling away from the impression cylinder and touching the form.

This form of delivery apparatus is assumed to be provided with means, for example similar to that hereinbefore described, for effecting the required travel of the carrier tapes. The operation of the apparatus is similar in both forms.

The bar 10 may be detachably secured so that in order to facilitate make ready it may

be slid rearwardly on the channel frame, thus affording access to the cylinder.

In the form first described with reference to Figures 1 to 10 the frame 2 of the delivery apparatus is pivoted at the rear on pins or trunnions at points 114, Figures 1 and 2, on standards 97, and at the forward end may rest on uprights 99.

These uprights are those which are usually provided on a wharfedale machine to support the flyer frame. They can be raised up and down in guide brackets 98 by a handle 115. As usual they may be linked at their lower ends to a counterbalance lever, these parts not being indicated as they are well known in the art.

The delivery apparatus can thus be readily raised and lowered to facilitate rapid "make ready" and as the parts automatically retain their correct relationship with the cam shaft 7, the troubles attendant on the usual drum flyer delivery apparatus are avoided.

In order that the delivery mechanism shall be put out of action automatically when it is raised for "making ready" the cam shaft 7 is provided with a clutch 104 which, when the apparatus is lowered into the operative position, effects a driving connection between the cam shaft 7 and a clutch member 105 on a driving member such as a sprocket wheel 100, and when the apparatus is raised is automatically disengaged. The sprocket wheel 100 is freely mounted on the cam shaft 7 and is driven by a chain 101 from a sprocket 102 on the main driving shaft 103. The clutch member 104 slides on a feather 106 on the shaft 7 when a pulley 107 which is loose on the shaft 7 is rotated by a belt 108, one end of which is fixed to the pulley 107 and the other is connected to the frame 2. This rotation of the pulley winds up a spring 109 having one end fixed to the pulley and the other fixed to a pin 115′ carried by a stationary part of the machine.

A cam ring 213 is mounted on the member 104, so that said member can rotate, but the cam ring is held against rotation by suitable means such as a rod 214, screwed into the cam ring and engaging in a slot 215 in the bracket 216 fixed to the end of the frame 2, the slot 215 preventing the cam ring 213 rotating but permitting it to be moved axially with the clutch member 104. The bracket 216 may also serve to carry the pin 115′ by means of the member 217. The cam ring 213 and the pulley 107 have co-operating cam surfaces 112, 113. A spring 108′ disengages the member 104 from the member 105 when the frame 2 is raised, and when the frame is lowered the spring 109 rotates the pulley 107 and thus engages the two members 104, 105, against the action of the spring 108′.

As no working parts or obstructions exist above or at the sides of the end of the reciprocatory carrier inter-leaving is facilitated. Either form of delivery apparatus above described is capable of easy application to existing machines of the respective types referred to thus rendering such machines more efficient in printing high class work.

A form of delivery apparatus according to the invention suitable for a two-revolution cylinder printing machine or an off-set printing machine, is illustrated in Figures 12 and 13.

This form of delivery apparatus is shown applied to a two-revolution machine in Figures 15 and 16.

In Figures 12, 13, 15 and 16, 1 represents the impression cylinder. 58 are grippers mounted on a shaft 59 carried in a frame 60 and adapted to co-operate with a bar 60′ forming part of this frame. The grippers are intended to grip each sheet and draw it from the cylinder 1. Such a form of gripper mechanism is well known in the art and the means for opening and closing the grippers are omitted for sake of clearness. The frame 60 slides to and fro horizontally in guide frames or channels 61. The frame 60 has a cross bar 62 provided with spaced blocks 63 to which a set of tapes 64 is secured, the tapes being wound on spring rollers 65 mounted on a shaft 66, which is carried in side plates 67 formed on the forward ends of bars 67′ carrying the channels 61. The outer ends of the bars 67′ are pivoted at 70′ on the main framing 70 of the machine. The bars 67′ with the channels 61 and other parts carried thereby are periodically raised and lowered, for a purpose hereinafter explained, by a cam 116 mounted on a shaft 117 which extends across the machine and is supported in bearings in the main frame of the machine.

A lever 118 is mounted on a shaft 119 supported by the main frame of the machine.

The lever 118 has a roller 120 bearing on the cam 116. Levers 132 fixed on the shaft 119 are connected by connecting-rods 121 to the side plates 67.

A bar 68 provided with spaced blocks 69 is mounted on the stationary main framing 70 of the machine.

A set of tapes 71 is provided, and these tapes are secured at their inner ends to the blocks 69 and are secured at their other ends and wound on spring rollers 72 mounted on a shaft 73 carried by slide blocks 74 sliding in guides or channels 75.

The blocks 74 are formed as extensions of the frame 40′ of a reciprocatory endless tape carrier 40, comprising rollers 42 and 43 and tapes 41 operated similarly to the carrier 40 hereinbefore described with reference to Figures 1 and 2, except that in the present example the carrier 40 is shown to be reciprocated by toothed wheels 122

meshing with racks 123 formed on the frame 40′ of the carrier. The wheels 122 are rotated first in one direction and then in the other by a toothed sector 124 meshing with a small pinion 125 on the shaft 126 of the wheels 122, the shaft 126 being mounted in the stationary framing 70 of the machine. The sector 124 is carried by a lever 127 pivoted on a shaft 128 carried by the main framing 70 and having a roller 129 in contact with a cam 130 on the shaft 117. A spring 131 is attached at one end to the lever 127 and at the other end to the framing 70.

It is to be understood that this mechanism for reciprocating the carrier 40 is only an example as other means for performing the same function will be obvious to a person skilled in the art.

In operation the sheet is gripped by the grippers 58 and taken off the impression cylinder 1 in a horizontal direction (to the left of Figures 12 and 15) the tapes 64 being at the same time drawn out to the left to receive the sheet which is released by the grippers and deposited on it without any rubbing contact or relative movement between sheet and tapes. While this occurs the tapes 71 are also drawn out to the left. At the end of this operation the bars 67′ and parts carried thereby descend so that the sheet on the tapes 64 is deposited on to the tapes 71.

The carrier 40 and the rollers 72 now advance together to the right (of Figures 12 and 15) so that the sheet is relinquished by the tapes 71 and is simultaneously taken up or received by the tapes 41 of the carrier 40 and on subsequent reciprocations thereof eventually deposited on the piling table as in the form of invention first above described.

A prolonged test of the form of apparatus first described on an old wharfedale machine has demonstrated that high class three colour printing can be effected without fear of smutting or smearing, and with considerably more ease and safety to the operator as compared with the same machine when fitted with the usual drum flyer delivery mechanism.

In each form of the invention it is possible to take off the sheet at the speed of the impression cylinder and the delivery of the sheets by the reciprocatory endless tape carrier may be at a relatively slower speed. This is important when printing on very thin or very thick paper as it avoids shifting or buckling of the sheets when a high speed of printing is adopted.

I claim:—

1. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact, and a reciprocatory endless tape carrier adapted to co-operate with said support, so that as said support rolls up and relinquishes the sheet the tapes of said carrier travel relatively to their rollers and are thereby extended beneath the sheet to receive it without rubbing contact between said sheet and the tapes of said carrier.

2. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact, an endless tape carrier, means for reciprocating said carrier relatively to said support, and means for moving the tapes of said carrier while it moves towards and follows said support to enable a sheet relinquished by the support to be simultaneously received by the tapes of the carrier without hubbing contact and to effect the discharge from said carrier of a sheet previously received by it from said support, substantially as and for the purpose hereinbefore set forth.

3. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact, an endless tape carrier, means for reciprocating said carrier relatively to said support, means for moving the tapes of said carrier while it moves towards and follows said support to enable a sheet relinquished by the support to be simultaneously received by the tapes of the carrier without rubbing contact and to effect the discharge from said carrier of a sheet previously received by it from said support, and means for freeing the tapes during the outward reciprocatory movement of said carrier so that the tapes thereof do not travel relatively to their rollers during this outward movement.

4. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact, and an endless tape carrier, means for reciprocating said carrier relatively to said support, means for moving the tapes of said carrier while it moves to-

wards and follows said support to enable a sheet relinquished by the support to be simultaneously received by the tapes of the carrier without rubbing contact and to effect the discharge from said carrier of a sheet previously received by it from said support, means for freeing the tapes during the outward reciprocatory movement of said carrier so that the tapes thereof do not travel relatively to their rollers during this outward movement, and adjustable means for effecting a travelling movement of the tapes of the carrier during part of the outward movement thereof for the purpose of compensating for sheets of varying width, substantially as and for the purpose hereinbefore set forth.

5. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact and a reciprocatory endless tape carrier adapted to co-operate with said support, so that as said support rolls up and relinquishes the sheet the tapes of said carrier travel relatively to their rollers and are thereby extended beneath the sheet to receive it without rubbing contact between said sheet and the tapes of said carrier, a frame for supporting the whole of the aforesaid mechanism and for guiding said roller blind support and carrier, and a pivotal support for one end of said frame for the purpose of allowing said frame to be raised to facilitate make ready.

6. A sheet delivery apparatus for a printing machine comprising means including grippers for gripping a sheet and withdrawing it from the cylinder of the machine without making rubbing contact with any part, a support of the roller blind type adapted to unroll and to roll up below said sheet so as to receive and to relinquish it respectively without rubbing contact, and a reciprocatory endless tape carrier adapted to co-operate with said support, so that as said support rolls up and relinquishes the sheet the tapes of said carrier travel relatively to their rollers and are thereby extended beneath the sheet to receive it without rubbing contact between said sheet and the tapes of said carrier, a frame for supporting the whole of the aforesaid mechanism and for guiding said roller blind support and carrier, and a pivotal support for one end of said frame for the purpose of allowing said frame to be raised to facilitate make ready, a driving shaft, and means operable by said shaft for operating said gripper means, roller blind support and reciprocatory carrier and means for disengaging said operating means from said shaft when said frame is moved upwardly about its pivotal support.

In testimony whereof I have signed my name to this specification.

ARTHUR WILLARD RANGER.