

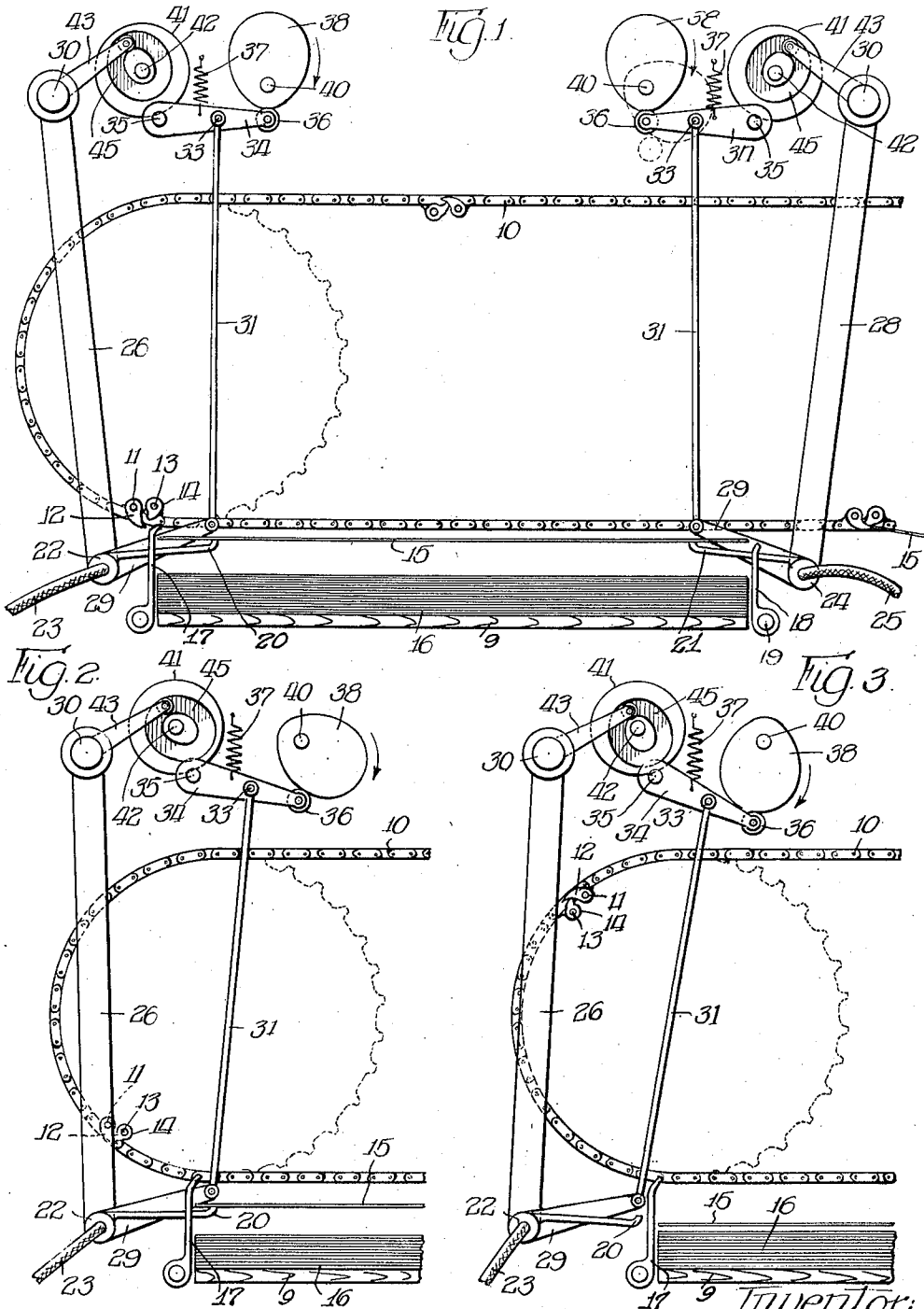
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SHEET DELIVERY DEVICE

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SHEET DELIVERY DEVICE

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The invention relates to improvements in sheet delivery devices and has reference more particularly to an improved sheet delivery device for use with printing presses or similar machines which first performs some operation on the sheet.

In depositing sheets on a delivery pile of a printing machine the sheets are advanced to a position over the pile at a certain height above the same and then released. Heretofore the sheet has generally been allowed to descend by its own weight and the air cushion created, especially by a sheet of considerable size, has caused the sheet to flutter during its descent. This is undesirable as movement of a sheet laterally with respect to an adjacent sheet may blur the fresh ink impression. Also if the printing press is operated at high speeds serious trouble is encountered as the air cushion may prevent equally rapid depositing of the sheet.

It is possible to apply an air blast from above the sheet as the same is released by the delivery grippers but this does not effect the desired result with regularity. Also devices have been used for pressing down either the forward or rear edge of the sheet but these do not entirely solve the difficulty as the opposite edge is free and must descend by its own weight.

An object of the invention is to provide a sheet delivery device which will operate in an improved manner by engaging the sheet along opposite edges, thereby retaining control of the entire sheet while the same is moved downwardly for deposit on the pile.

Another object of the invention is to provide a sheet delivery device having holding means which will engage the underside of the sheet along opposite edges so as not to blur the impression on the face of the sheet and which will move downwardly while retaining a sheet in this manner to deposit the same on the pile.

Another object resides in the provision of a sheet delivery device wherein the holding means will have movement downwardly and outwardly away from each other so as to apply tension to the sheet to hold the same taut while depositing the sheet on the pile.

Another object is to provide a sheet delivery device having holding means for engaging the sheet along opposite edges and adjustable means for depressing the holding means whereby the holding means can be moved downwardly in unison or one holding means can be moved downwardly in advance of the other.

A more specific object of the invention is to provide a sheet delivery device having two inde-

pendent sets of holding means in the form of suction nozzles for engaging opposite edges of the sheet respectively and wherein each set is supported so as to have movement downwardly and outwardly away from each other, whereby tension is applied to the sheet while the same is being moved downwardly for deposit on the pile.

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, drawing and claims appended hereto.

In the drawing which illustrates an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is an elevational view of a sheet delivery device constructed in accordance with the invention and showing the sheet holding means in engagement with a sheet immediately after release thereof by the delivery grippers;

Figure 2 is a fragmentary elevational view showing the forward end of the sheet delivery device of Figure 1 and illustrating the position of the sheet holding means after the same has completed about one-half its downward movement; and

Figure 3 is a fragmentary elevational view also showing the forward end of the sheet delivery device of Figure 1 with the holding means in the position they assume after release of the sheet.

The embodiment of the invention selected for illustration in the drawing essentially consists of conventional sheet supporting means 9, sheet conveying means which may comprise endless delivery chains 10 carrying gripper devices arranged at suitable intervals along each chain. The gripper devices are also of the conventional type comprising a gripper shaft 11 with grippers 12 fixed to said shaft and which are actuated in a manner well known in the art. A non-rotatable rod 13 carries pad members 14 against which the sheet 15 is held by the grippers 12. A pair of said delivery chains are employed which carry the gripper shaft 11 and pad bar 13 with the gripper devices thereon as above described and accordingly the gripper devices will have engagement along the forward edge of sheet 15 and adjacent each corner thereof. In the operation of the sheet conveying means the gripper devices engage the forward edge of the sheet as the same is about to be released by the printing press or other machine and the endless delivery chains travel in a direction to convey the sheet and locate the same over the pile 16. The pile 16 is

supported by any suitable means such as a table 9 operatively connected with the printing press or other machine so as to have gradual downward movement as the pile increases in height. This structure is generally employed in apparatus of this kind and as the same is not concerned with the invention, disclosure is not considered necessary. Joggers 17 and 18 are arranged preferably along the forward and rear end respectively of the pile, said joggers being suitably supported by shafts 19 extending across the width of said pile.

The sheet holding means comprises two separate and distinct sets of suction nozzles 20 and 21 which are adapted to engage the underside of the sheet at the forward end and rear end, respectively. Each set of suction nozzles may consist of any number such as will extend from one longitudinal edge of the sheet to the other when properly spaced. As shown in Figure 1, the suction nozzles 20 extend from a cylindrical member 22 which may be described as a header for the suction nozzles, the same having connection with a vacuum pump through the flexible hose 23. In a like manner the suction nozzles 21 also join with their header 24 having connection to a vacuum pump by the flexible hose 25.

The header 22 providing the set of suction nozzles 20 is rotatably supported by a lever 26 and a similar lever 28 supports the header 24 providing a set of suction nozzles 21, each lever being secured at its extreme upper end to a rotatable shaft 30 which permits the levers to have oscillating movement.

Each of the headers 22 and 24, which are rotatable with respect to their supporting levers, has secured thereto an arm 29 pivotally joined at its outer end to a vertical rod 31. The rods 31 each pivotally connect as at 33 with a lever 34 supported in turn for oscillating movement by the shaft 35. The outer end of the levers 34 carry a roller 36 yieldingly held in contact with its respective depressing means by springs 37. Said depressing means may comprise a cam 38 fixed to a rotating shaft 40 driven by any suitable power means or said shafts may be driven by the printing press or other machine with which the delivery device is associated. Having rotation in synchronism with cams 38 are other cams 41 rotated by shafts 42. Each cam actuates a lever 43 which carries a roller at its outer end riding in the cam race 45 in its respective cam. The levers 43 are fixed to shafts 30 and accordingly as said cams 41 are rotated the levers 26 and 28 will be oscillated to produce a swinging movement of the suction nozzles as they are caused to move vertically by the depressing means.

When the parts above described assume the position shown in Figure 1 it will be observed that the cams 38 have rotated to permit the rollers 36 and thus the rods 31 to move to their uppermost limit under the action of the springs 37 which locates each set of suction nozzles in its upper limit of travel. It will also be observed that the cams 41 have rotated so as to locate the levers 26 and 28 inwardly, which positions the suction nozzles within the area of the sheet so that the same will support the sheet and engage the sheet immediately after release thereof by the gripper devices. Accordingly, the forward edge of the sheet is seized by the suction nozzles 20 and the rear edge by the suction nozzles 21. When the sheet is thus seized by said nozzles or holding means its forward travel is stopped but

the sheet is maintained in a substantially horizontal plane parallel to that assumed during its travel. As the cams 38 rotate to depress each set of suction nozzles the cams 41 rotate in synchronism therewith, producing outward swinging movement of said nozzles and accordingly the holding means travel outwardly away from each other as their downward movement progresses. This will be clearly understood from an inspection of Figure 2 which shows the forward cams 38 and 41 after each has moved through a part of one revolution. The holding means 20 in engagement with the forward edge of the sheet has been depressed and has been moved correspondingly nearer the edge of the sheet. The outward travel of the holding means produced by the outward swinging movement of the levers 26 and 28, respectively, results in tensioning the sheet, maintaining the same taut while it is being deposited on the pile. In Figure 3 the forward cams 38 and 41 have each completed one-half a revolution and have depressed the holding means to its lowest position and oscillated the same to its extreme outward position, causing release of the sheet.

It will be assumed that both the cams 38 reach the same position simultaneously and that the cams 41 are rotated in synchronism therewith and therefore the sheet is released by the forward and rear holding means simultaneously. During the downward movement of the holding means the sheet has been under positive control and has been maintained in a plane substantially parallel with that assumed by it during its travel to a position over the pile. It may be desirable to deposit either the forward or rear edge of the sheet in advance of the other. This can be accomplished by the present delivery device merely by advancing the rotative position of one cam 38 with respect to the other. For an illustration, assume that the rear edge of the sheet is to be deposited in advance of the forward edge, then the rear cam would be advanced such as shown in dotted lines in Figure 1. Each holding means operates as described except that the suction applied to the nozzles is controlled, being cut off from the nozzles as nozzles 21 leave their edge of the sheet, thus allowing the forward nozzles 20 to freely move toward the forward edge as they deposit said edge of the sheet. Control of the suction applied to the nozzles may be found necessary when the forward and rear edge of the sheets are deposited simultaneously.

The present delivery device may be constructed with a straight line suction tube substituted for the separated nozzles 20 and 21, respectively, or the separated nozzles of each set may be located out of a straight line so that the sheet is seized at staggered points adjacent its forward and rear edges. Also instead of the nozzles one may apply grippers or other holding means.

It is believed that the action of the cams 38 in depressing the holding means will be readily understood from an inspection of the drawing, it being borne in mind that the arms 29 have securement to their respective header which is rotatably carried by its lever 26 or 28. Swinging movement of the suction nozzles in an arcuate path is effected by oscillation of said levers, each being fixed at their upper end to their shaft 30. As downward movement of the suction nozzles takes place they are caused to swing outwardly and shortly after release of the sheet they reach their outermost position, whereupon the motion is reversed and they are caused to swing

inwardly, which is accompanied by movement upwardly, the same being permitted by the cams 38. Each set of suction nozzles can therefore be described as having movement around its edge of the sheet as the same is being deposited on the pile.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawing, 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 a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, sheet seizing means arranged to receive a sheet from said conveyor, engage it at its lower surface only and along opposite edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said seizing means to move the latter outwardly and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

2. In a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, sheet seizing means arranged to receive a sheet from said conveyor, engage it adjacent its rear and front edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent the front and rear sides of said support, mechanism for operating said seizing means to move the latter outwardly and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

3. In a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, sheet seizing means arranged to receive a sheet from said conveyor, engage it at opposite edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said seizing means to move the latter outwardly in opposite directions and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

4. In a sheet delivery device, the combination

of a traveling sheet conveyor having sheet holding means, two sets of sheet seizing means arranged to receive a sheet from said conveyor and operating along different edges of such sheet to hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said seizing means to move the latter simultaneously outwardly and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

5. In a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, sheet seizing means arranged to receive a sheet from said conveyor, engage it at opposite edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said seizing means to move the latter in succession outwardly and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

6. In a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, sheet seizing means arranged to receive a sheet from said conveyor, engage it at its lower surface only and along opposite edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said seizing means to move the latter downwardly and outwardly and beyond said guides to deposit a sheet while within the confines of said guides and then move around the respective edges of said sheet into position to receive another sheet.

7. In a sheet delivery device, the combination of a traveling sheet conveyor having sheet holding means, suction means arranged to receive a sheet from said conveyor, engage it along opposite edges and hold it against further forward movement, a sheet support, sheet guides arranged adjacent opposite edges of said support, mechanism for operating said suction means to move the latter downwardly and outwardly and beyond said guides to deposit a sheet while within the confine of said guides and then move around the respective edges of said sheet into position to receive another sheet.

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