June 17, 1941. A. STOBB 2,245,836

SHEET FEEDER

Filed April 16, 1940 3 Sheets-Sheet 1

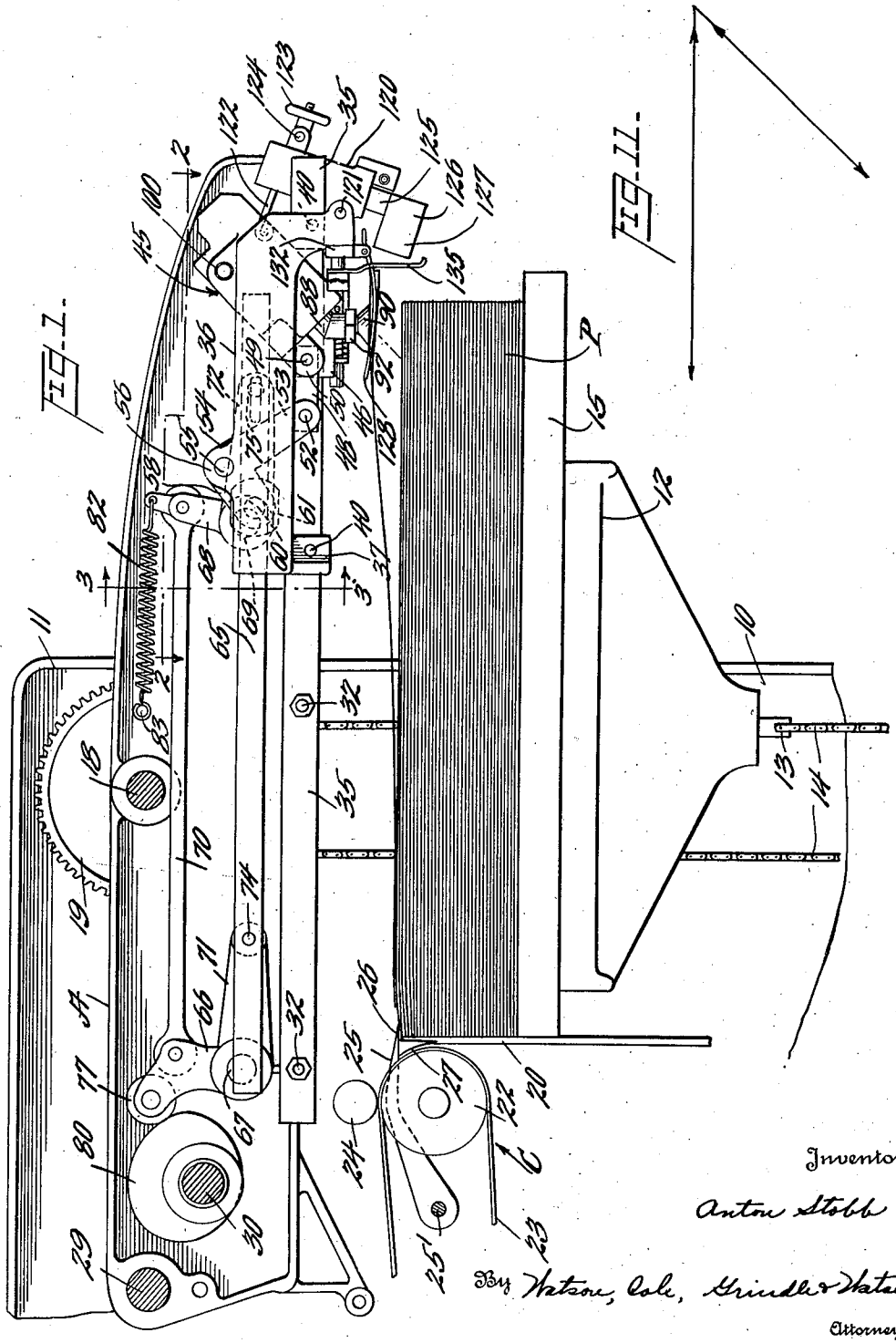


FIG. 1.

FIG. 11.

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June 17, 1941. A. STOBB 2,245,836

SHEET FEEDER

Filed April 16, 1940 3 Sheets-Sheet 2

FIG. 2.

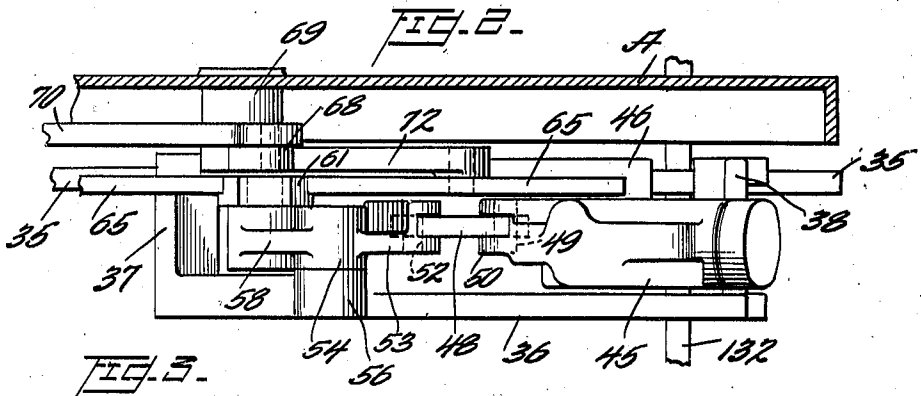


FIG. 3.

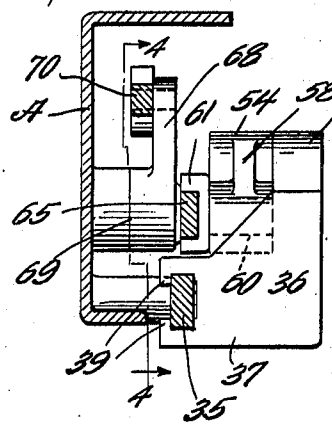


FIG. 4.

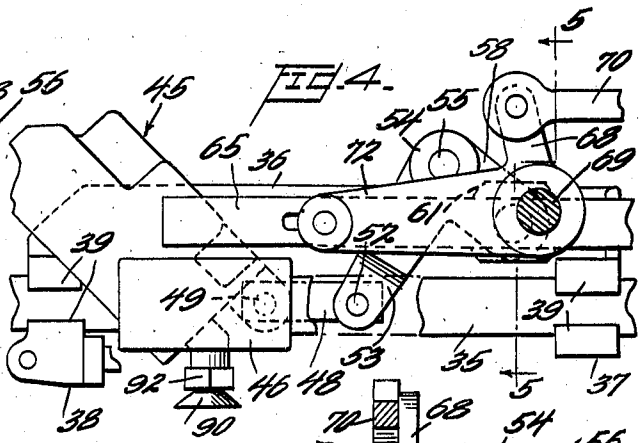


FIG. 5.

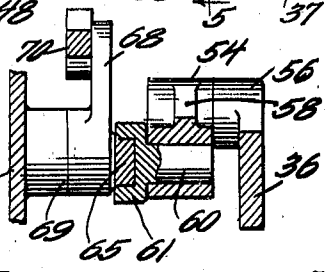


FIG. 6.

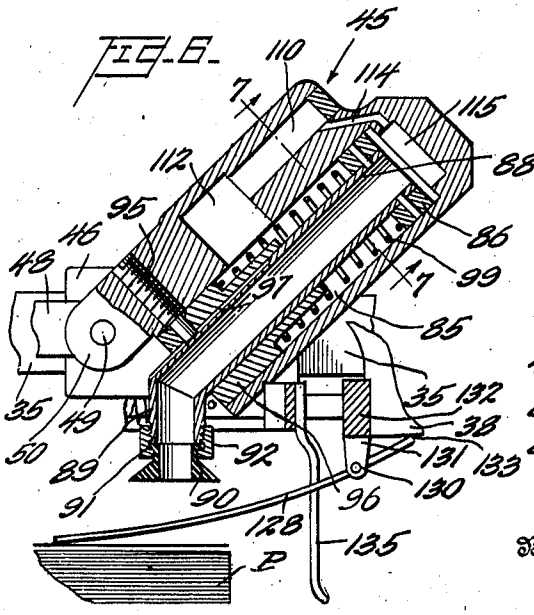
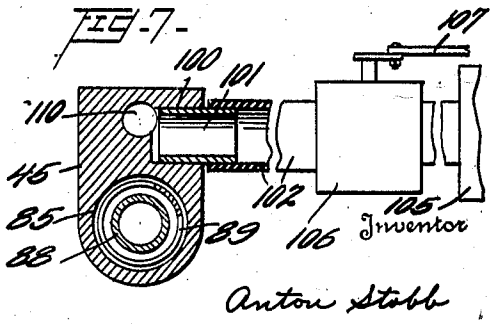


FIG. 7.



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June 17, 1941. A. STOBB 2,245,836

SHEET FEEDER

Filed April 16, 1940 3 Sheets-Sheet 3

FIG. 8.

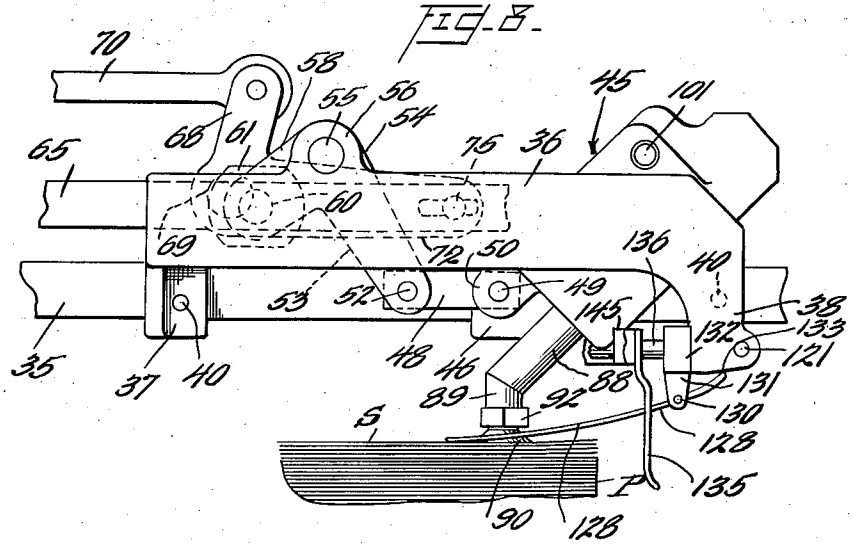


FIG. 9.

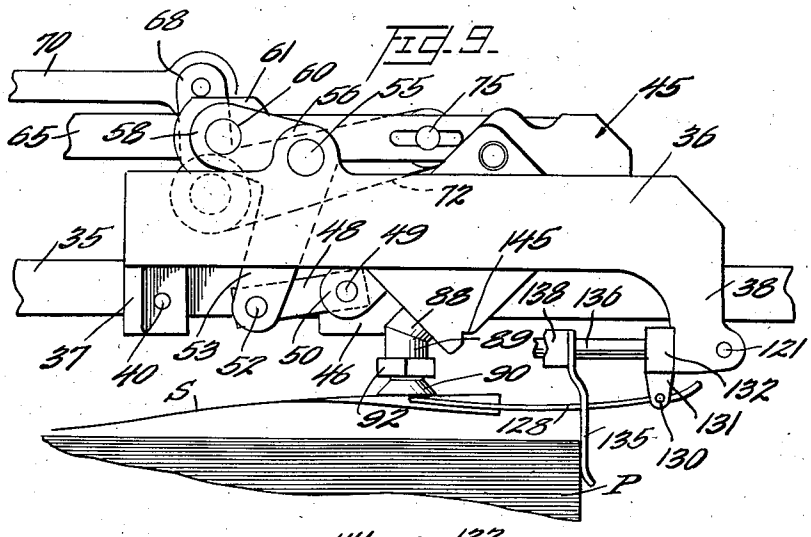
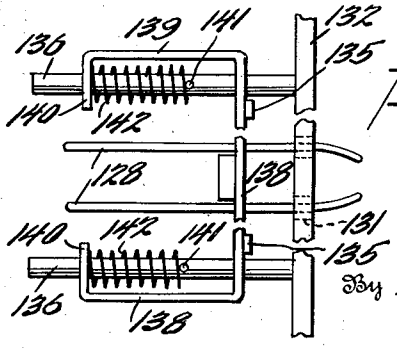


FIG. 10.



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Patented June 17, 1941 2,245,836

UNITED STATES PATENT OFFICE

2,245,836

SHEET FEEDER

Anton Stobb, Westfield, N. J., assignor to American Type Founders, Inc., Elizabeth, N. J., a corporation of New Jersey

Application April 16, 1940, Serial No. 329,965

24 Claims. (Cl. 271—26)

This invention relates to methods and apparatus for feeding sheets, and more particularly to methods and devices of the kind adapted for use in separating and forwarding individual sheets from a suitably supported pile of such sheets to printing presses, folding, slitting, gluing, or wrapping machines, or the like.

The general object of the invention is to provide a novel and improved sheet feeding mechanism which is adapted for operation at high speed upon sheets which may differ widely in size, thickness, quality, and material, without sacrifice of accuracy or control, and with a minimum of waste of either time or material. The improved feeder is of relatively simple and sturdy construction, which naturally facilitates its manufacture, operation and maintenance at low cost.

An important purpose of the invention is the provision of an improved feeder of the type which is equally well adapted to feed sheets from a pile, either singly and in spaced sequence, or in overlapping relationship, the latter method of feeding being known as "stream feeding." The advantages of stream feeding are well known, this method being pursued chiefly in order to permit more rapid feeding of the sheets while maintaining perfect registration of the successive sheets at the impression cylinder of the printing press or at the end of the conveyor usually employed in connection with folding machines or the like. The number of sheets on the conveyor intermediate the separating and feeding device and the operating mechanism which is to ultimately receive the sheets is increased as compared with the number of sheets so located in the case of serial feeding, while at the same time synchronous action of the sheet separating and feeding means with respect to the sheet conveyor means is maintained, one sheet being withdrawn and carried off by the latter means for each sheet separated and fed from the pile by the first mentioned means.

In practicing the stream feeding process, it has been found most desirable to seize or grip the successive top sheets of the pile at points adjacent their rear edges so that they may be separated from the pile and started on their forward movement onto the transfering conveyor without interference with the trailing end of the next preceding sheet which has not yet cleared the front edge of the pile, but is still in overlapping relationship to the forward or leading portion of the sheet being handled. It is also advantageous to combine the separating and forward feeding functions in a single instrumentality which is preferably a suction gripper capable of oscillatory movements having both longitudinal and vertical portions or components.

An important feature of the separating and feeding procedure is the fluffing up of the upper rear portion of the pile of sheets as, for example, by means of a blast or winding device which serves to separate a number of the uppermost sheets of the pile by the interposing of layers of air between the individual sheets adjacent their rear edges. This winding of the sheets not only aids in preventing the sheets adhering one to the other by reason of charges of static electricity or the interlocking of marginal burrs at their cut edges, but also serves to somewhat raise the top sheets of the pile toward the gripper element, whereby it may be more readily engaged by the gripper so that the latter need not descend solidly into contact with the pile in order to seize the sheet. This is also of advantage in making unnecessary an extremely accurate setting of the pile height gauge, especially in cases where the pile of sheets being acted upon is of uneven height. The air blast, which may be maintained in continuous operation, also functions to float each sheet as it is forwarded to the conveyor after separation from the pile.

With the overlapping of the sheets at the front edge of the pile during stream feeding, and the fluffing and floating of the loosened rear edges of the uppermost sheets—with the consequent elimination of pile engaging or pressure devices at the latter point—there exists more than ever the necessity for making provision for preserving the general shape and position of the upper portion of the pile and preventing disalignment of the sheets and the feeding of more than one sheet at a time. The arrangement of mechanism in accordance with this process of feeding also places some limitation on the available locations for a pile height gauge. These problems are solved, however, in this particular type of feeder, by the provision of a combined hold-down or presser member and height gauge finger at the front edge of the pile adjacent the mouth of the transfer conveyor which carries the stream of overlapping sheets from the feeder to the press or other machine being fed.

The placement of the hold-down member at this point makes it necessary to move each successive top sheet of the pile rearwardly for a short distance to withdraw its forward edge

from beneath the hold-down during its separation or removal from the pile and before the sheet is finally fed forwardly onto the conveyor. The application of these alternate rearward and forward movements by means of the novel unitary separating and feeding device, without sacrifice of speed or smoothness of operation, is one of the principal objects of the present invention.

In its preferred form, the invention contemplates the provision of a suction gripper mounted on a longitudinally extending guide carried by an oscillatory frame or feeder head supported above the top of the pile of sheets. Suitable driving mechanism is provided for reciprocating the gripper along the guide in synchronism with the movement of the conveyor and that of the device to which the sheets are ultimately delivered. This driving means may conveniently comprise a system of cranks and linkages actuated by a rotary cam, the latter being so shaped as to regulate the forward and rearward speed of movement of the gripper and preferably to provide, in the cycle of movement, a period of dwell during which the gripper may be extended to seize a sheet and retracted to raise it above the level of the top of the pile.

The gripper member itself comprises a pneumatic cylinder having a differential piston reciprocable therein along a rearwardly and upwardly inclined path, the piston being provided with a hollow piston rod upon the lower end of which is disposed a flexible suction cup. The cylinder is adapted to be placed in communication with a source of vacuum upon both sides of the piston, and the ratios of the area of the upper and lower surfaces of the piston and of the communicating passageways are such that the piston is moved downwardly toward the pile of sheets when suction is applied to the cylinder, and when the cup is sealed by the adherence thereto of a sheet, the piston is drawn upwardly and rearwardly into the cylinder.

By preferance the transmission is so designed that the dwell occurs at the rearward limit of movement of the gripper member, and at approximately this point, the suction cup is caused to descend toward the pile. Upon encountering the top sheet, the rear portion of which has been loosened from the pile by the air blast, the cup is sealed by the adhering sheet and the consequent inclined upward and rearward movement of the gripper cup causes the front edge of the sheet to be withdrawn from beneath the hold down; and upon the forward movement of the gripper member the sheet is fed over the hold-down to the conveyor. Upon entering the bite of the conveyor belts or rollers, the vocuum communication is cut off and the sheet is released by the gripper, which then moves rearwardly to complete its cycle of operation. In order to prevent too great an elevation of the top sheet by the winding means, and thus too great a curtailment of the horizontal component of movement of the gripper piston and suction cup, certain sheet guiding or confining means are provided.

Other objects and features of novelty, including the improved method of sheet feeding, will become clearly apparent when the following specification is read in connection with the accompanying drawings. In the drawings, one illustrative or exemplary embodiment of the invention is shown and will be hereinafter described in detail. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, but that various modifications, alterations, and rearrangements to suit varying conditions are contemplated, such as would occur to one skilled in the art to which the invention relates.

In the drawings,

Figure 1 is a view in longitudinal vertical section of the upper portion of a sheet feeder embodying the principles of the invention, the feeder head and associated mechanism being shown for the most part in side elevation, and the sheet gripper being in its farthest rearward and upward position;

Figure 2 is a fragmentary horizontal sectional view on an enlarged scale and taken on line 2—2 of Figure 1;

Figure 3 is a transverse vertical sectional view on the same scale as Figure 2 and taken on line 3—3 of Figure 1;

Figure 4 is a vertical longitudinal sectional view taken substantially on line 4—4 of Figure 3;

Figure 5 is a fragmentary detailed view in vertical transverse section taken on line 5—5 of Figure 4;

Figure 6 is a vertical central sectional view through the sheet gripper member;

Figure 7 is a sectional view of the gripper member taken on line 7—7 of Figure 6;

Figure 8 is a fragmentary view in side elevation of the feeder head in the immediate vicinity of the gripper member, and showing the gripper member in its rearward shifted position and the suction cup in its extended position;

Figure 9 is a similar view showing the gripper member in its forward or delivery position with the suction cup retracted;

Figure 10 is a vertical longitudinal sectional view on a reduced scale of a detail of the feeder head; and

Figure 11 is a diagram of the cycle of movement of the suction cup under the preferred contions of operation.

Referring more particularly to Figure 1 of the drawings, the sheet feeder will be seen to include the supporting frame 10, the two spaced side frame portions of which extend upwardly upon either side of the machine, one of them being indicated at 11. Between the side frames there is disposed the pile elevator which includes the platform 12 secured as at 13 to the elevator chains 14, and adapted to support the pile board 15 upon which the pile P is supported. The elevator chains 14 are trained over a sprocket wheel (not shown) carried by the elevator shaft 16. The shaft 16 extends from one of the side frames 11 to the other, and is provided with a driving gear 19, the whole arrangement being conventional and forming no part of the present improvement.

A pile gauge 20 is provided at the front of the pile P and just rearwardly of the sheet forwarding conveyor C. The conveyor is preferably of the endless belt type and includes a roller 22 over which the belt 23 is adapted to run, and a drop roll 24 which serves to apply pressure to the successive sheets passing along the conveyor. Bearing upon the front edge of the pile is the hold-down member 25, which is provided with a tapered finger 26 overlapping the pile and a downwardly projecting abutment element 27 so disposed as to embrace the forward edge of the pile of sheets. The hold-down member 25 is secured to the transverse shaft 25' and in order

to enable the member 25 to perform the additional function of a pile height gauge the shaft 25' is connected by suitable mechanism (not shown) with the pile elevator driving device. One example of such a connection is illustrated in the copending application of David P. Sanford, Serial No. 323,995, filed March 14, 1940, but within the scope of the present invention the pile height regulating mechanism may take any suitable form.

Above the longitudinal center line of the device there is supported—by means of the transverse shaft 29, the elevator shaft 18 and the cam shaft 30—the auxiliary frame A, which in the present example comprises an elongated peripherally flanged casting provided at suitable points with apertured bosses providing bearings for the shafts referred to, and also providing means for supporting portions of the sheet gripper actuating means. Secured to the lower portion of the frame A as by means of the screws or bolts 32 is the elongated longitudinally extending guide or track bar 35, along which the gripper supporting and actuating mechanism and the winding device, are adapted to be moved to and from suitable positions with respect to the rear edges of the piles of sheet material to be fed.

The details of the gripper member and its associated mechanism are very clearly shown in Figures 2–7, inclusive, of the drawings. A substantially U-shaped bracket 36 provided with the arms 37 and 38 at the respective forward and rearward ends thereof is adjustably secured upon the track bar 35 which is adapted to be received within the spaced jaws 39 of the arms 37 and 38. Set screws such as indicated at 40 serve to secure the bracket rigidly in any adjusted position along the track bar 35. As clearly shown in Figure 2 of the drawings, the main portion of the bracket 36 is spaced from the track bar 35, and there is disposed between these members the extensible gripper member indicated in its entirety by the numeral 45.

The gripper member 45 comprises a substantially cylindrical casing disposed at an angle to the horizontal and provided preferably adjacent its lower end with the slotted slide portion 46 which is adapted to embrace and ride upon the track bar 35. Operating mechanism is provided which includes the short link 48 pivoted as at 49 between the slide portion 46 and the spaced ear 50 of the member 45. The link 48 is pivoted at its forward end, as by means of the pin 52, between the bifurcations of the generally rearwardly extending arm 53 of the bell crank 54. The bell crank 54 is pivoted upon the pin 55 carried by the upwardly extending lug 56 formed on the bracket 36, and the forward arm 58 of the bell crank carries a pin 60 which has a slotted head 61 adapted to slidingly receive the parallel-motion operating bar 65.

The bar 65 is adapted to be oscillated in a vertical plane while maintaining its horizontal position by means of the following mechanism. A forward bell crank 66 is pivoted to the frame A as at 67 and a corresponding rear bell crank 68 is pivotally supported from the frame as at 69. Upwardly extending arms of these two bell cranks are connected for providing simultaneous operation by means of the link 70, and the respective rearwardly extending arms 71 and 72 of the bell crank 66 and 68 are pivotally connected to the operating bar 65 as by the pin connection 74 and the pin and slot connection indicated at 75. The upwardly extending arm of the forward bell crank 66 is provided with a cam follower roller 77 which is adapted to be maintained in contact with the cam 80 carried by the cam shaft 30, as by means of a suitable spring, such as that indicated at 82 as extending between the upwardly extending arm of the rear bell crank 68 and a pin 83 on the frame A.

From the foregoing it will be readily understood that rotation of the cam 80 in synchronism with the operation of the conveyor C and preferably with respect to the operation of the machine to which the sheets are being fed, causes the bell cranks 66 and 68 to oscillate and, through the pivotal connections, effects the vertical reciprocation of the parallel bar 65. It will be further understood that no matter where the adjusted position of the bracket 36 upon the track bar 35 may be, the operating bar 65 is always received within the slotted head 61 of the element 60 carried by the arm 58 of the gripper actuating bell crank 54. Thus in every one of the adjusted positions, the vertical reciprocation of the bell 65, through the bell crank 54 and the link 48 will cause the gripper member 45 to move to and fro upon the track bar 35. This movement takes care of the fore-and-aft feeding and return movements of the gripper member 45 as a unit, but the sheet lifting provisions of the device have yet to be described.

As most clearly shown in Figures 6 and 7 of the drawings, the body portion of the gripper member 45 is provided with a cylindrical chamber 85 inclined at substantially the same angle as said body portion. Arranged for reciprocation within the chamber 85 is the piston 86 which is carried upon the upper end of the tubular piston rod 88, the lower end of which is provided with an angular downward extension 89 which carries the suction cup 90. The suction cup 90 is preferably made of rubber or equivalent material and has an upper flange 91 which is adapted to be clamped to the lower end of the tubular extension 89 as by means of the threaded flanged sleeve 92. Fixedly secured within the lower end of the cylindrical chamber 85 as by means of the set screw 95 is the guide sleeve 96 within which the piston rod 88 is adapted to reciprocate. This sleeve also serves to seal off the lower end of the pneumatic cylinder from the atmosphere. The piston rod 88 is provided in its upper surface with a slot or groove 97 which is adapted to receive the lower attenuated end of the set screw 95 which thus acts as a spline or key to prevent rotation of the rod 88 and thus maintain the cup continually in its vertical operative position. The sleeve 96 is shouldered to provide a seat for the relatively weak coil spring 99 which is compressed between the sleeve 96 and the lower face of the piston 86.

In one of the side walls of the body portion of the gripper member 45, there is provided a bore or recess 100 into which a nipple 101 is introduced and which is connected, as by means of the flexible hose 102, with a source of vacuum or reduced pressure diagrammatically indicated in Figure 7 at 105. In this communicating conduit 102 there is disposed a suitable valve means, also diagrammatically suggested at 106, by which the application of suction to the gripper unit may be controlled and synchronized with the other moving parts of the feeder as by means of the connections indicated at 107. The timing of the valve with relation to the other mechanism for attaining various modifications of the feeding cycle will be presently described.

The recess 100 in the gripper 45 communicates with a passageway 110 which in turn is placed in communication with the cylindrical chamber 85 at a point beneath the piston 86 by means of the transverse passageway 112. A restricted passageway 114 provides communication between the passageway 110 and the space 115 at the upper end of the cylindrical chamber 85. From this space 115 the hollow interior bore 116 of the piston rod 88 leads to the suction cup 90.

From this description, it will be obvious that when subatmospheric pressure is produced in the pneumatic connections leading into the gripper unit, the piston 86 will be drawn downwardly within the chamber 85 against the relatively weak pressure of the spring 99, due to the larger connections leading to the cylinder beneath the piston as compared with the restricted passageway 114 leading to the head of the chamber and also due to the fact that the space 115 above the piston is, at this initial point in the cycle, in communication with the atmosphere through the hollow piston rod and the unobstructed suction cup. The cup 90 is thus moved downwardly and forwardly with respect to the gripper cylinder and approaches the top of the pile P, the upper sheets of which have been fluffed up and floated to some extent above the normal solid top of the pile. Upon contact of the suction cup 90 with the rear portion of the top sheet of the pile, the cup will be sealed by the sheet and the upper end of the cylinder will be cut off from communication with the atmosphere. Thus the vacuum or negative pressure will build up upon the upper side of the piston 86 which, now that the central bore of the piston is sealed off, is of an area considerably larger than the area of the annular under side of the piston, and the piston and the attached suction cup will rise within the cylinder to the initial upward and rearward position shown in Figure 1 and will be ready to start the forward feeding movement along the track bar 35 under the influence of the cam 80.

The winding device which is preferably continually supplied with air under pressure is shown at 120 in Figure 1 of the drawings, the main body of the device being pivoted as at 121 to the lower rear portion of the longitudinally adjustable bracket 36. The upper portion of the winding or blast attachment is adjustably secured to the bracket 36 as by means of the hook 122, one end of which is threaded through a nut 123 pivoted as at 124 to the body of the winding device. The downwardly extending blast tube 125 is provided with a nozzle opening 126 directed toward the rear portion of the pile P and provided with the hood 127 for confining the blast.

It will be apparent at once that if the top sheet of the pile is raised excessively by the blast or winding means, the sheet will be seized by the suction cup before the piston begins to descend, or before it has descended to any great extent along its downwardly and forwardly inclined path. If the sheet is seized by the gripper at such points, there will be either no rearward movement of the sheet before the sheet forwarding movement, or such rearward component would be insufficient to completely withdraw the front edge of the sheet from beneath the hold-down. In order to insure that the descending movement of the cup is sufficient to provide, upon its return, the necessary horizontal component to effect the withdrawal of the sheet, there are provided guiding or limiting arms 128 which are pivoted as at 130 to depending lugs 131 secured at spaced points upon the transverse bar 132 carried by the rear leg 38 of the adjustable bracket 36. The rear ends of the arms 128 are curved upwardly and are adapted to abut a portion of the bracket 36 as at 133 to serve to limit the downward movement of their forward ends. These arms are of sufficient weight to prevent excessive elevation of the sheets by means of the blast but are light enough to be easily raised by the successive sheets as they are lifted by the suction gripper.

A pair of resiliently mounted rearwardly disposed jogger blades 135 are supported from the bracket 36 and are adapted to intermittently tap the upper rear edge of the pile of sheets to aid in preserving the alignment and proper position of the sheets. In order to support these blades 135 for horizontal movement the forwardly projectly rods 136 are provided, the rear ends of these rods being secured at spaced points to the cross bar 132, the blades 135 themselves are secured at their upper ends to the support 138 which is bent to provide forwardly extending arms 139 which terminate in inwardly bent portions 140; both the body portion of the element 138 and the inturned ends 140 being perforated to receive the guide rods 136. Upon each of the rods 136 are disposed the spring stops 141, and a coil spring 142 surrounds each of the rods 136 and is adapted to be compressed between the stops 141 and the inwardly bent ends 140 of the support 138. A right angled notch 145 is formed in the cylinder casing of the gripper member 45 near its lower end in order to provide a square surface to abut intermediate portion of the support 138 during the rearward movement of the gripper, and to move the member 138 together with the jogger blades 135 rearwardly against the tension of the springs 142. The rearwardly displaced position of the blades 128 is shown in Figure 8 of the drawings. Upon the forward movement of the gripper member 45 the springs 142 are free to urge the blades 135 forwardly against the rear of the pile as indicated in Figure 9 of the drawings.

A complete cycle of operation of the feeder will now be described. In Figure 1 of the drawings, the gripper unit 45 is disposed at its extreme rearward position along the track bar 35, and the suction cup 90 carried by the piston 88 of the telescoping gripper member is in its rearwardly retracted position. In the preferred mode of operation of the device, suction is applied to the opening 100 of the gripper member at this point and cup 90 descends along its inclined straight line path downwardly and forwardly toward the rear portion of the top sheet of the pile. Upon contacting with the top sheet S, as shown in Figure 8 of the drawings, the gripper cup is sealed by the sheet and the preponderance of suction upon the upper side of the piston causes the device to retract along the same diagonal upward and rearwardly inclined path and thus drawing the front edge of the sheet 8 rearwardly from beneath the hold-down finger 26. The extreme retracted position of the device is shown in Figure 1 in which the forward edges of the sheet are free from the hold-down member and the sheet is ready to be moved forwardly over the hold-down member toward the conveyor C. This forward movement is accomplished by sliding the gripper member 45 for-

wardly along the track bar **35** to the extreme forward delivery position shown in Figure 9 of the drawings. At this point the front edge of the sheet has passed over the upper surface of the hold-down member **25** and has just entered the mouth of the conveyor C between the belt **23** and the conventional drop roll **24**. At this point also the passageways of the gripper member **45** are cut off from communication with the source of vacuum and the sheet is released from the cup **90**. Then as the larger portion of the cam **80** moves against the roller **77** the mechanism will be actuated to move the gripper unit **45** rearwardly upon the trackway **35** to the position illustrated in Figure 1, however, without the sheet attached. Thereupon the described cycle of operation will be repeated and successive sheets removed.

From the foregoing description it will be seen that by means of the present invention there has been provided a novel and improved sheet feeder of simple construction and operation which is particularly adapted for the efficient feeding of sheets, especially in accordance with the stream feeding method.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a pile board, comprising, in combination, a feeder head supported above the pile, a suction gripper movably carried by said feeder head, means for reciprocating said gripper in a straight line horizontally above the rear portion of said pile in a fore-and-aft direction and means actuated at a point in the cycle of horizontal movement for causing said gripper to descend toward the pile, seize a sheet, and then move diagonally upwardly again to raised position.

2. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a vertically movable pile board comprising, in combination, a hold-down member disposed at the forward edge of the pile and adapted to press resiliently upon the successive top sheets thereof, a feeder head supported above the pile, a suction gripper movably carried by said feeder head, means for reciprocating said gripper horizontally above the rear portion of said pile in a fore-and-aft diection and means actuated at a point in the cycle of horizontal movement for causing said gripper to descend toward the pile, seize a sheet, and then move diagonally upwardly and rearwardly in a straight line path to raised position, whereby the sheet is withdrawn from beneath the hold-down before being forwarded from the pile.

3. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a vertically movable pile board comprising, in combination, a hold-down member disposed at the forward edge of the pile and adapted to press resiliently upon the successive top sheets thereof, a feeder head supported above the pile, a suction gripper movably carried by said feeder head, means for reciprocating said gripper horizontally above the rear portion of said pile in a fore-and-aft direction and means actuated at the rearmost point of the horizontal reciprocating path of movement of the gripper for causing said gripper to descend toward the pile, seize a sheet, and then move diagonally upwardly again along a straight line path, whereby the sheet is withdrawn from beneath the hold-down before being forwarded from the pile.

4. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a vertically movable pile board comprising, in combination, a hold-down member disposed at the forward edge of the pile and adapted to press resiliently upon the successive top sheets thereof, a feeder head supported above the pile, a suction gripper movably carried by said feeder head, means for reciprocating said gripper horizontally above the rear portion of said pile in a fore-and-aft direction, means actuated at the rearmost point of the path of horizontal reciprocating movement of the gripper for causing said gripper to descend toward the pile, seize a sheet, and then move diagonally upwardly again along a straight line path, whereby the sheet is withdrawn from beneath the hold-down before being forwarded from the pile, and means included in said first named means for causing a momentary dwell in the reciprocating movement of the gripper at said rearmost point for permitting said sheet seizing and withdrawing movement to be completed before the forward feeding movement takes place.

5. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a pile board, comprising, in combination, a feeder head supported above the pile, a diagonally extensible telescoping suction gripper movably carried by said feeder head, means for reciprocating said gripper in a straight line horizontally above the rear portion of said pile in a fore-and-aft direction, and means actuated at a point in the cycle of horizontal movement for causing said gripper to be extended toward the pile, seize a sheet, and then be retracted diagonally upwardly and rearwardly to raised position, whereby the sheet is withdrawn from beneath the hold-down before being forwarded from the pile.

6. Sheet feeding mechanism for separating and feeding sheets from a pile supported by a vertically movable pile board comprising, in combination, a hold-down member disposed at the forward edge of the pile and adapted to press resiliently upon the successive top sheets thereof, a feeder head supported above the pile, a suction gripper movably carried by said feeder head, means for reciprocating said gripper horizontally above the rear portion of said pile in a fore-and-aft direction, means actuated at the rearmost point of the horizontal reciprocating path of movement of the gripper for causing said gripper to descend toward the pile, seize a sheet, and then move diagonally upwardly again along a straight line path, whereby the sheet is withdrawn from beneath the hold-down before being forwarded from the pile, and means for winding the rear edges of the sheets during the sheet separating and forwardly movement of said gripper, the rearwardly disposed gripper means and said winding means comprising the sole means for feeding the sheets off the pile.

7. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a sheet gripper mounted for longitudinal reciprocation on said trackway, mechanical driving means for reciprocating said gripper member along said trackway, and pneu-

matic means for moving said gripper downwardly toward the pile, effecting the seizure of a sheet thereby, and moving the gripper diagonally upwardly and rearwardly along a straight line path to its raised position.

8. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a sheet gripper mounted for longitudinal reciprocation on said trackway, mechanical driving means for reciprocating said gripper member along said trackway, and pneumatic means operating at a point in the cycle of reciprocating movement for moving said gripper downwardly toward the pile, effecting the seizure of a sheet thereby, and moving the gripper diagonally upwardly and rearwardly along a straight line path to its raised position for resumption of said reciprocating movement by said mechanical means.

9. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a sheet gripper member mounted for longitudinal reciprocation on said trackway, mechanical driving means for reciprocating said gripper member along said trackway alternately in opposite directions, said gripper member comprising a rearwardly inclined cylinder, a piston slidable therein, and a sheet gripper element on the lower end of said piston, means for controlling the supply of fluid pressure to said cylinder to cause said piston to move to and from the pile of sheets to seize and withdraw a sheet from the pile, and means for timing the admission of fluid pressure with respect to the horizontal reciprocation of said member so as to insure that at least the sheet withdrawal movement has a rearward component.

10. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a sheet gripper member mounted for longitudinal reciprocation on said trackway, mechanical driving means for reciprocating said gripper member along said trackway, said gripper member comprising a rearwardly inclined cylinder, a piston slidable therein, and a sheet gripper element on the lower end of said piston, means for controlling the supply of fluid pressure to said cylinder to cause said piston to move to and from the pole of sheets to seize and withdraw a sheet from the pile, and means for timing the admission of fluid pressure with respect to the horizontal reciprocation of said member so as to cause the piston to descend toward and recede from the pile along its rearwardly and upwardly inclined straight line path during a dwell at the extreme rearmost limit of reciprocating movement of said gripper member.

11. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a bracket associated with said trackway, means for adjustably securing said bracket to said supporting frame at selected points longitudinally of the direction of feed so as to position it above the rear portions of piles of sheets of varying lengths, a sheet gripper member slidably mounted on said trackway, means for reciprocating said gripper member along said trackway including a lever fulcrumed on said bracket and connected to said gripper member, and operating means for said lever, said lever being connectable to said operating means at a number of points along said supporting frame depending on the adjustment of said bracket.

12. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a bracket associated with said trackway, means for adjustably securing said bracket to said supporting frame at selected points longitudinally of the direction of feed so as to position it above the rear portions of piles of sheets of varying lengths, a sheet gripper member slidably mounted on said trackway, means for reciprocating said gripper member along said trackway including a bell crank fulcrumed on said bracket, a link connecting one arm of said bell crank to said gripper member, and operating means for said bell crank, said operating means comprising a horizontal bar and means for reciprocating it vertically in constant parallel relation to the top of the pile, and a sliding connection between the other arm of said bell crank and said bar.

13. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a bracket associated with said trackway, means for adjustably securing said bracket to said supporting frame at selected points longitudinally of the direction of feed so as to position it above the rear portions of piles of sheets of varying lengths, a sheet gripper member slidably mounted on said trackway, means for reciprocating said gripper member along said trackway including a bell crank fulcrumed on said bracket, a link connecting one arm of said bell crank to said gripper member, operating means for said bell crank, said operating means comprising a horizontal bar and means for reciprocating it vertically in constant parallel relation to the top of the pile, and a sliding connection between the other arm of said bell crank and said bar, and a winding nozzle carried by said bracket and adjustable therewith, said nozzle being directed toward the pile at its rear upper edge.

14. Sheet feeding mechanism for separating and feeding sheets from a pile supported on a pile board which is carried by a supporting frame comprising, in combination, a supplemental

frame extending above the pile board, a horizontal trackway carried by said supplemental frame and disposed above the pile longitudinally of the direction of feed, a bracket associated with said trackway, means for adjustably securing said bracket to said trackway at any point therealong longitudinally of the direction of feed so as to position it above the rear portions of piles of sheets of varying lengths, a sheet gripper member slidably mounted on said trackway, means for reciprocating said gripper member along said trackway including a bell crank fulcrumed on said bracket, a link connecting one arm of said bell crank to said gripper member, and operating means for said bell crank, said operating means comprising a horizontal bar and means for reciprocating it vertically in constant parallel relation to the top of the pile, and a sliding connection between the other arm of said bell crank and said bar.

15. In a sheet feeding device of the class described, in combination, a supporting frame disposed above a pile of sheets, an extensible sheet gripper member, means for moving said member along said frame alternately forwardly and rearwardly, said member comprising a cylinder whose axis is inclined rearwardly and upwardly, a piston adapted to reciprocate in said cylinder along said axis, a vertically disposed suction cup on the lower end of said piston, and means for regularly placing said cylinder into and out of communication with a source of vacuum, whereby said piston and cup will move toward and from the pile to seize and lift a sheet, along a rearwardly and upwardly inclined path.

16. In a sheet feeding device of the class described, in combination, a supporting frame disposed above a pile of sheets, a longitudinally disposed horizontal track bar carried by said frame and being of a length at least equal to the length of the longest sheet intended to be handled by the device, a substantially U-shaped bracket lying in a horizontal plane, means for adjustably securing the arms of said bracket at selected points along said track bar, a sheet gripper member slidably engaged with said track bar and confined between the arms of said bracket for limited oscillatory movement along such portion of said track bar as determined by the selective positioning of said bracket.

17. In a sheet feeding device of the class described, in combination, a supporting frame disposed above a pile of sheets, a longitudinally disposed horizontal track bar carried by said frame and being of a length at least equal to the length of the longest sheet intended to be handled by the device, a substantially U-shaped bracket lying in a horizontal plane, means for adjustably securing the arms of said bracket at selected points along said track bar, a sheet gripper member slidably engaged with said track bar and confined between the arms of said bracket for limited oscillatory movement along such portion of said track bar as determined by the selective positioning of said bracket, and means for oscillating said gripper member, said means including parts carried by said adjustable bracket and connected to said gripper member, parts carried by said frame, and means for maintaining operative driving connections between said parts at any position of said bracket and gripper member.

18. In a sheet feeding device of the class described, in combination, a supporting frame disposed above a pile of sheets, a longitudinally disposed horizontal track bar carried by said frame and being of a length at least equal to the length of the longest sheet intended to be handled by the device, a substantially U-shaped bracket lying in a horizontal plane, means for adjustably securing the arms of said bracket at selected points along said track bar, a sheet gripper member slidably engaged with said track bar and confined between the arms of said bracket for limited oscillatory movement along such portion of said track bar as determined by the selective positioning of said bracket, and means for oscillating said gripper member, said means including a bell crank fulcrumed on said bracket and having one of its arms connected to said gripper member, an oscillating bar carried by said frame and maintained in parallel relation with said track bar, and an adjustable sliding connection between said oscillating bar and the other arm of said bell crank.

19. In a sheet feeding device of the class described, a telescoping suction gripping member comprising a block having a cylindrical chamber therein which is inclined at an angle to the horizontal, a piston adapted to reciprocate in said cylindrical chamber, a hollow piston rod coaxial with said cylindrical chamber, a suction cup on the end of said rod having a vertical axis and adapted to maintain its vertical position during all movements of said piston.

20. In a sheet feeding device of the class described, in combination, a horizontally oscillating gripper member, a pile jogger blade disposed rearwardly of the pile of sheets and guided upon a horizontal longitudinally extending supporting element, spring means for urging said blade forwardly toward said pile, and an abutment on said slidable jogger adapted to be contacted by a cooperating abutment on said gripper member for moving said jogger away from the pile during the removal of a sheet by said gripper member.

21. The method of separating and feeding sheets from a pile to a machine for further handling or treatment, comprising gripping the uppermost sheet at a point adjacent its rear edge, drawing the rear portion of the sheet diagonally rearwardly and upwardly along a straight line path, then moving said gripped portion of the sheet forwardly along a horizontal path and then releasing the sheet.

22. The method of separating and feeding sheets from a pile to a machine for further handling or treatment, comprising floating the top sheets of the pile from the rear thereof, gripping the uppermost sheet at a point adjacent its rear edge, drawing the rear portion of the sheet diagonally rearwardly and upwardly along a straight line path, then moving said gripped portion of the sheet forwardly along a horizontal path, then releasing the sheet from the gripping means, and conveying it off to the machine to be fed.

23. The method of separating and feeding sheets from a pile to a machine for further handling or treatment, comprising holding down the front edges of the sheets of the pile, floating the top sheets of the pile from the rear thereof, gripping the uppermost sheet at a point adjacent its rear edge, drawing the rear portion of the sheet diagonally rearwardly and upwardly along a straight line path, thus withdrawing the front edge of the sheet from beneath the hold-down means, then moving said gripped portion of the sheet forwardly along a horizontal path over the hold-down means, then releasing the sheet from

the gripping means, and conveying it off to the machine to be fed.

24. In a sheet feeding device of the class described, in combination, a supporting frame disposed above the pile of sheets, a gripper member adapted to be reciprocated horizontally along said frame, means for extending said gripper member toward the pile of sheets along a downwardly and forwardly inclined path and for retracting said gripper member along the same path in a reverse direction upon seizing a sheet, winding means for floating the top sheets of the pile, and means for limiting the elevation of the top sheet under the influence of said winding means, said means being yieldable upwardly upon elevation of the sheet by said gripper member.

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