Aug. 6, 1935. H. EHLIG 2,010,586

SHEET FEEDER

Filed July 14, 1931 4 Sheets-Sheet 1

FIG. 1.

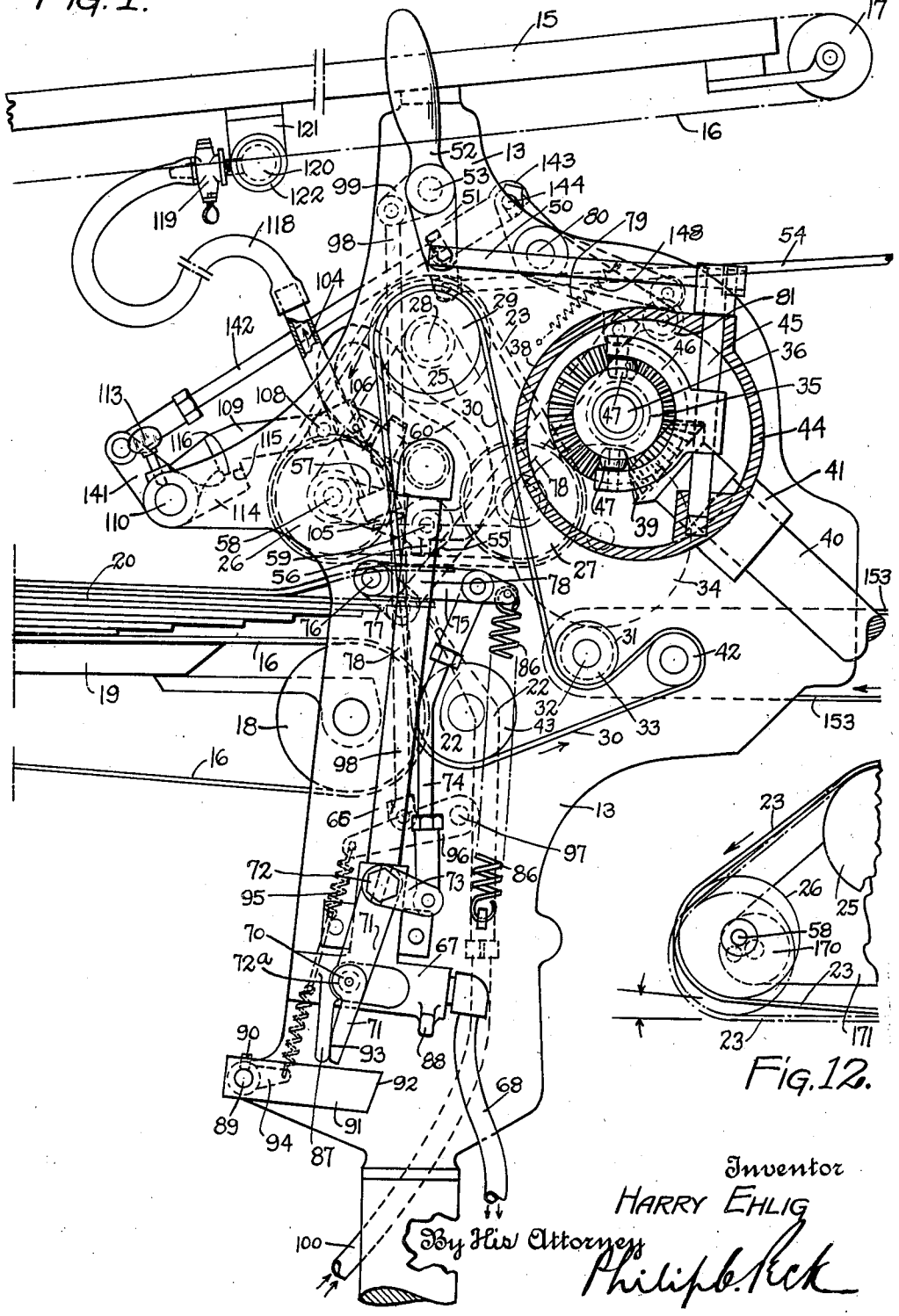


FIG. 12.

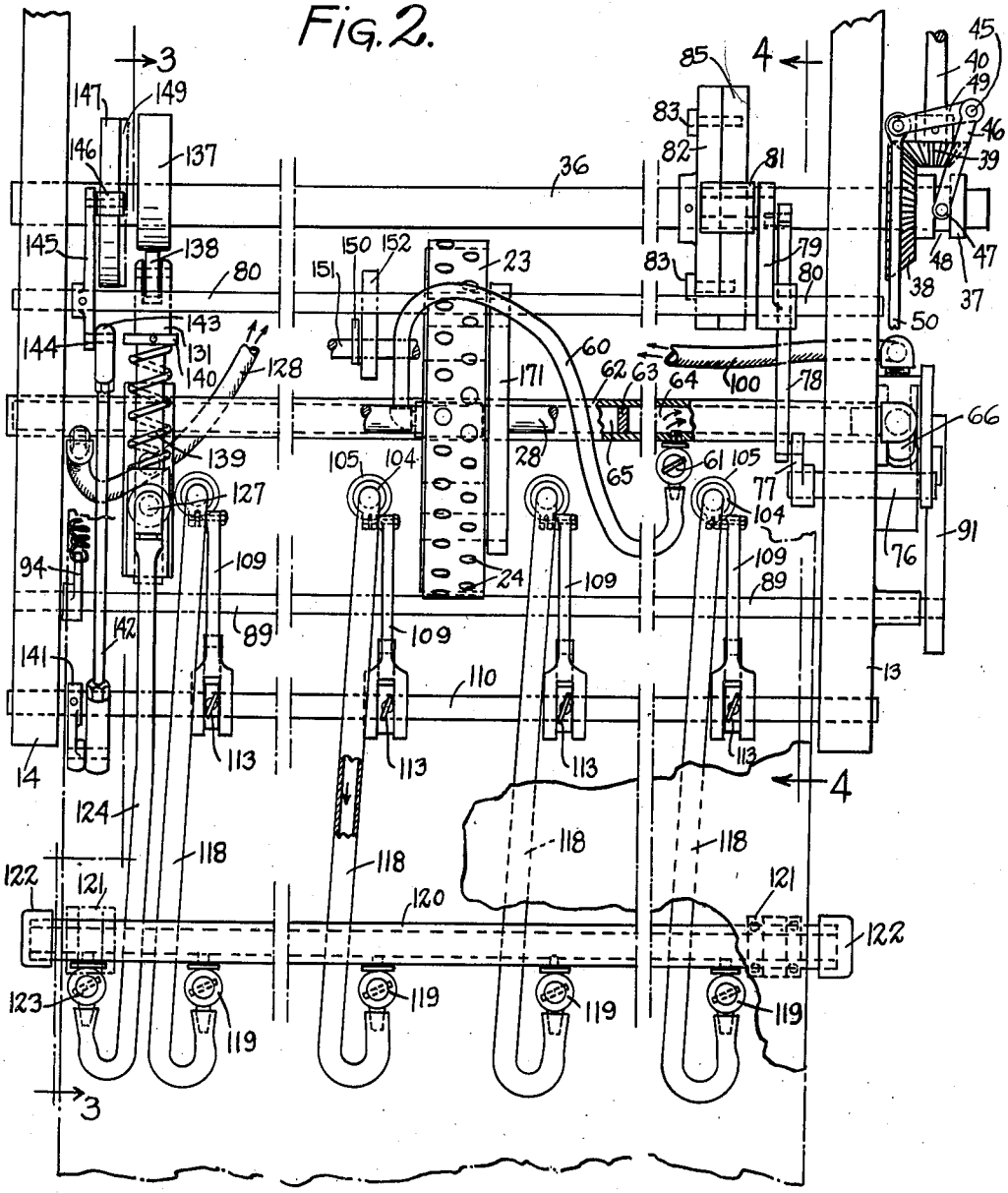
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SHEET FEEDER

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FIG. 2.



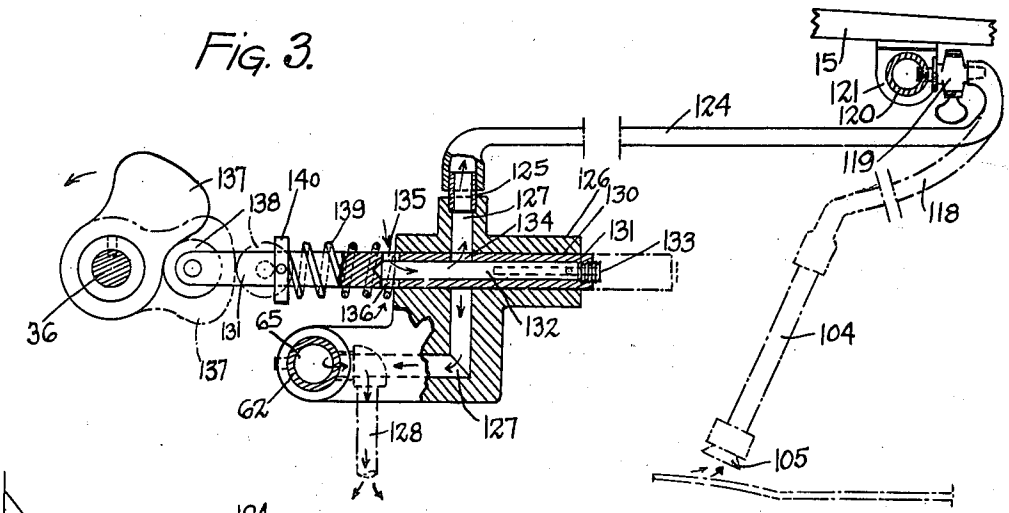
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SHEET FEEDER

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Fig. 3.



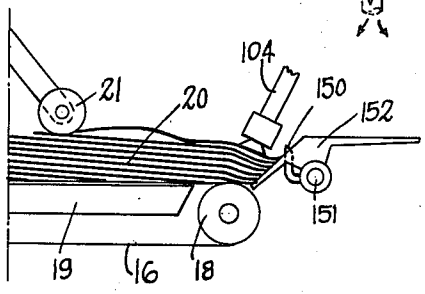


Fig. 11.

Fig. 4.

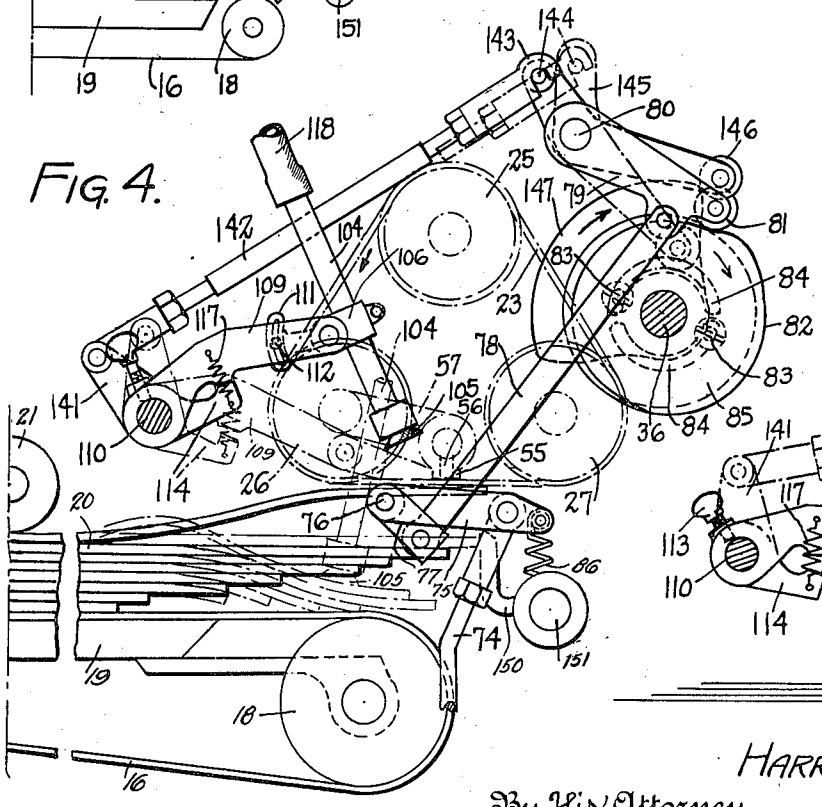


Fig. 10.

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SHEET FEEDER

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Fig. 5.

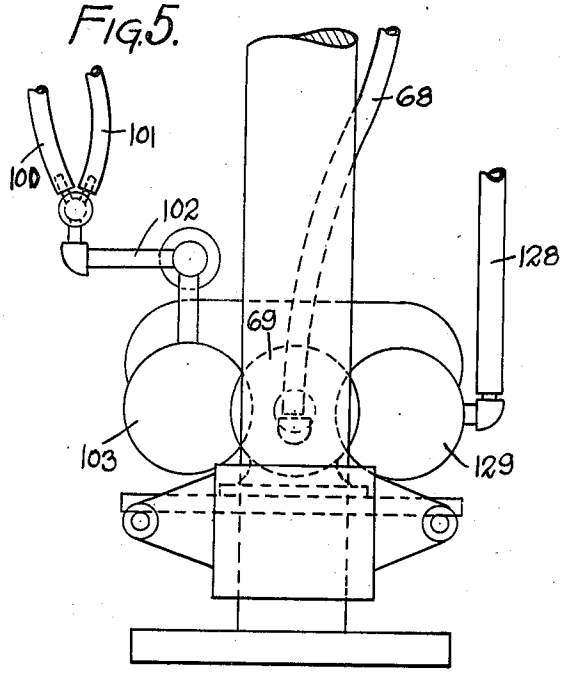


Fig. 8.

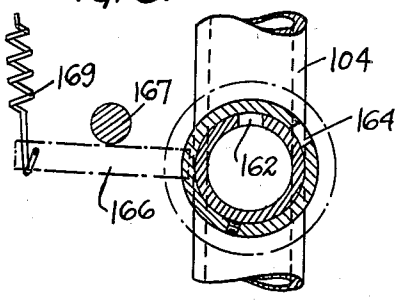


Fig. 9.

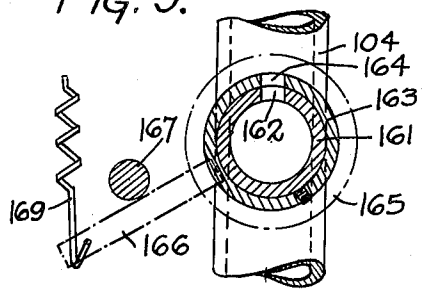
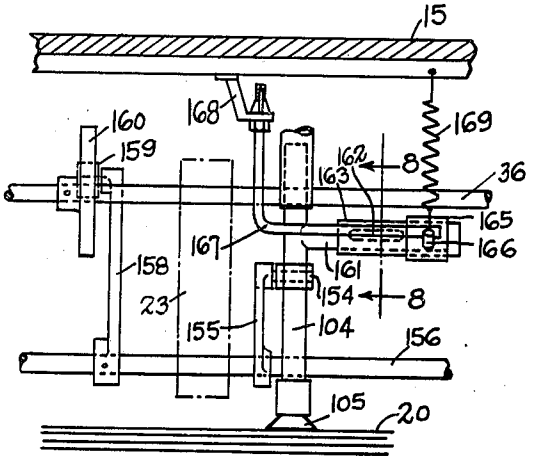


Fig. 7.



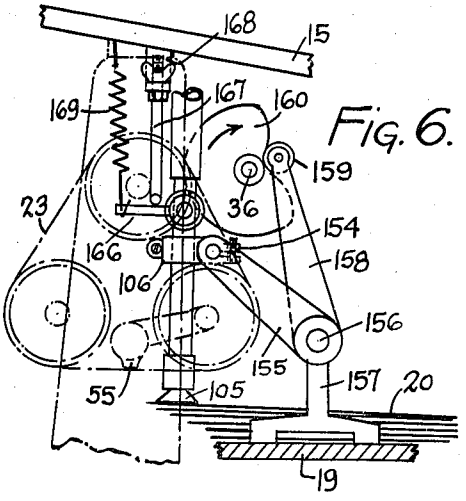


Fig. 6.

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Patented Aug. 6, 1935 2,010,586

UNITED STATES PATENT OFFICE

2,010,586

SHEET FEEDER

Harry Ehlig, Pearl River, N. Y., assignor to Dexter Folder Company, New York, N. Y., a corporation of New York (1934)

Application July 14, 1931, Serial No. 550,674

16 Claims. (Cl. 271—37)

My invention relates to improvements in sheet feeders for automatically separating and advancing successive sheets of paper or other impression-receiving material to printing, folding or ruling machines, or to such other types of machines as are devised to operate thereafter on such sheets.

The objects of my invention are, among others, mainly to provide a sheet-feeder of this character having a simplified design and which will have embodied therein separate mechanisms capable of performing efficient work, not likely to get out of order, very sensitive in action, and all incorporated in a feeder which will automatically, and with great rapidity, invariably separate and feed or advance the successive sheets from a pile or bank of paper, but preferably from a fanned-out bank of paper on the feed-board.

With these objects in view, I have devised a front edge feeder particularly adapted to separate and advance heavy stock having ribbed or rough surfaces, for example, paper bags, which require a powerful air blast to raise the front portions within effective range of the sheet advancing means, by embodying in such feeder a series of oscillating suction sheet separating tubes or sheet-lifters which not only separate the topmost sheet from the subjacent sheets but also properly position same relatively to the air blast and a suction feed-belt used for completing the separation of such sheet and advancing same to the machine thereafter operating on the successive sheets.

These oscillating suction tubes or lifters are preferably arranged in transverse alinement across the feeder, and, in the embodiments of the invention herein shown, have suction created therein and are rocked downwardly until each tube seating itself independently of the others on the irregular surface of the top sheet or bag, grips the same and continues its travel downwardly and rearwardly with a yielding movement so as to depress the front margin of the bank of sheets or bags and slightly move the topmost one rearwardly from out of contact with the front edge stop fingers. Thereafter the suction tubes are raised simultaneously to bring the front portion of the topmost sheet or bag within effective range of the air blast and also of the suction belt, the tubes, about this time, having the suction broken, therein and the belt seizing the sheet or bag and holding the same under suction control during the forward travel of the belt to advance such sheet or bag to sheet conveyors or other means.

As the suction tubes slide the sheet or bag slightly to the rear, the leading edge is drawn back out of the zone of the stop fingers which extend along the front of the bank and act as a straightener by being set to aline with a predetermined position for the advancement of the stock on a lower feed-board. Such stop fingers also act to straighten the leading edges of the stock when the bank moves forward on said feed-board, and are of particular advantage when feeding heavy stock which does not readily lend itself to the usual "fanning out" operation and uniform separation.

When feeding heavy stock with a rough surface, the suction is maintained continuously through the feed belt, but is preferably intermitted when feeding light weight stock by any suitable means to bring the action of the belt in proper timed relation with each cycle of the machine. On the other hand the vacuum created in the suction tubes or lifters is predeterminedly controlled, and is broken when the sheet is brought within effective range of the air blast for seizure by the feed-belt.

Further objects of my invention are to provide means to render the oscillating suction tubes or lifters inactive so that the suction feed-belt may be operated independently of such tubes when desired; to provide means to vary the line of travel of the lower run of the suction belt by raising or lowering the lower rear pulley carrying the belt so that such line of travel will conform substantially with the angle of the sheet that is being brought within the effective range of the suction belt; furthermore to provide separate and independent valve controls for the vacuum created in the suction belt and oscillating tubes whereby both vacuum created in and atmosphere admitted to such members may be separately controlled independently of each other.

My improved sheet-feeder also embodies other advantageous features of novelty and improvement in which the different operating parts are greatly simplified in form and action, and are made more effective and otherwise better adapted for use, all of which will be hereinafter described and then particularly set forth in the appended claims.

The drawings show my improvements in their preferred embodiments in a continuous sheet-feeder; such improvements, however, are not to be restricted to any particular type of sheet-feeder, as the invention may be embodied in various forms of feeders with similar advantages and results.

In the drawings, Fig. 1 is a side elevation of an improved feeder constituting one embodiment of my invention, some parts being shown in vertical section;

Fig. 2 is a top plan view of the feeder shown in Fig. 1, certain parts being omitted;

Fig. 3 is a side view on the line 3—3 of Fig. 2;

Fig. 4 is a side view on the line 4—4 of Fig. 2 with certain parts omitted and others in section;

Fig. 5 is a side view of a double vacuum pump and blower;

Fig. 6 is a detail side view of an improved feeder constituting another embodiment of my invention, showing mechanism for operating and oscillating the suction tubes or lifters;

Fig. 7 is an end view of the embodiment shown in Fig. 6 looking from the left thereof;

Figs. 8 and 9 are enlarged sectional views on the line 8—8 of Fig. 7 showing different positions of the valve operating mechanism illustrated in Figs. 6 and 7;

Fig. 10 is a detail side view of the tube oscillating mechanism shown in Figs. 1, 2 and 4;

Fig. 11 is a detail side view of the forward part of the bank and associated parts; and

Fig. 12 is a detail view showing adjusting mechanism for the lower rear pulley carrying the suction belt.

Similar numerals refer to similar parts throughout the several figures.

Referring to the drawings and more particularly Figs. 1 and 2, the side-frames 13 and 14 support the upper supply table 15 of the usual form in a continuous feeder, which table 15 carries the feed-belts 16 passing around pulleys 17 and 18 respectively journalled in the supply table 15 and lower feed-board 19 also mounted in the side-frames 13 and 14 and carrying said feed belts. The bank of fanned-out sheets 20 is advanced to the sheet separating and advancing mechanisms by the feed-belts 16 in the usual way. When the fanned out bank 20 is comprised by bags or similar heavy stock, the front marginal portion of the pile or bank will extend above the lower feed board 19, as shown in Fig. 1 of the drawings, and the sheets in said portion will tend to spread apart through the inherent springy nature of the stock. Above the bank of sheets 20 and pressing downwardly thereon, is the customary pile-drag 21 (Fig. 11), and the front edges of the sheets are separated by the usual air blast issuing from the nozzles 22 (only one being shown in Fig. 1).

In accordance with the present invention, the oscillating separating or lifting tubes above referred to engage the sheets with sheet separating and advancing devices comprising the endless loop suction-belt 23 having spaced-apart perforations 24 (Fig. 2), which belt, as herein shown, passes around three pulleys 25, 26 and 27 arranged in verticular triangular formation (Fig. 1) so that the lower run of the belt 23 will lie over the front margin of the bank of sheets 20 and in close proximity thereto in order to seize the top sheet and separate and advance same from the bank 20. The belt 23 is driven from the pulley 25 secured to the cross-shaft 28 journalled in the side-frames 13 and 14.

The cross-shaft 28 carries the sprocket gear 29 operated by the sprocket chain 30 driven by the sprocket gear 31 mounted on the cross-shaft 32 journalled in the side-frames 13 and 14. The shaft 32 carries the pinion 33 which engages the intermediate gear 34 that is driven by the pinion 35 secured to the main cam-shaft 36. Slidably keyed to the shaft 36 is the clutch collar 37 carrying the bevel gear 38 which is adapted to engage with the bevel gear 39 mounted on the end of the power shaft 40 journalled in the collar 41 secured to the side-frame 13, which power shaft 40 is rotated from any suitable source of power (not shown). The sprocket chain 30 also passes around the idler sprockets 42 and 43 mounted in the side-frame 13, as shown in Fig. 1.

Mounted in the side-frame 13 is the circular casing 44 in which is journalled the shaft 45 to which is affixed the forked lever 46 carrying the pivoted rollers 47 which are adapted to ride within the groove 48 cut in the clutch collar 37. Secured to the upper end of the shaft 45 is the arm 49 connected by the rod 50 to the lower end of the throw-off lever 51 having the handle 52 which lever 51 is pivoted on shaft 53 carried by the side-frames. Also pivoted to the lower end of lever 51 is the throw-off rod 54 extending forwardly over the sheet conveyor (Fig. 1).

Resting on the lower run of the perforated suction belt 23 is the suction shoe or nozzle 55 (Fig. 1) having a flat open face with the cross slot 56 bearing in sealing contact with the inner surface of the belt 23. The nozzle 55 is carried on the arm 57 mounted on the shaft 58 of the lower rear pulley 26, and the inner chamber 59 of the shoe or nozzle 55 is connected by the hose 60 to the valve cock 61 mounted on the right side (Fig. 2) of the cross-pipe 62 carried by the side-frames 13 and 14. The plug 63 in the pipe 62 divides same into two chambers 64 and 65 so that the suction shoe 55 is connected with the chamber 64 by the hose 60 when the valve cock 61 is open.

The right end of the pipe 62 (Fig. 2) is connected with the vertical pipe 66 fastened to the side-frame 13 and terminates in the horizontal pipe chamber 67 (Fig. 1) the right end of which is connected by the hose 68 to the suction pump 69 (Fig. 5).

Means are provided for controlling the suction in the shoe or nozzle 55 that are shown in Figs. 1 and 2: Midway in the side of the chamber 67 is the port 70 to open the interior of the chamber 67 to atmosphere to break the suction in the nozzle 55. The port 70 is adapted to be opened and closed by the rock arm 71 keyed to the rock shaft 72 and the rock arm 71 carries the valve 72^a that registers with the port 70. Secured to the shaft 72 is the arm 73 connected by the adjustable rod 74 to the rock-lever 75 pivoted on the short shaft 76 journalled in the side-frame 13 (Fig. 1). Secured to the inner end of the shaft 76 is the rock arm 77 connected by the link 78 to the rock arm 79 pivoted on the cross shaft 80 fastened to the side-frames 13 and 14.

The outer end of the arm 79 carries the cam-roller 81 that engages the cam 82 pinned to the cam-shaft 36 (Fig. 2). Adjacent the cam 82 and adjustably secured thereto by the screw pins 83 working in the curved slots 84 (Fig. 4) is the adjustable circular plate 85 to variably control the cam dwell to accommodate for sheets of different lengths and thereby the timing of the suction intermission applied to the shoe or nozzle 55 by the variable movement of the oscillating valve 72 opening and closing the port 70. The spring 86 affixed to the outer end of the rock lever 75 and the side-frame 13 keeps the roller 81 in engagement with the cam 82, and the lugs 87 and 88 on the outer surface of the chamber 67 limit the oscillating movement of the rock-arm 71 carrying the valve 72^a.

Means are provided for holding the arm 71 in its right hand position (Fig. 1) with the port 70 open to atmosphere when it is desired to break the suction in the nozzle 55 upon throw-off of the feeding mechanism by the actuation of the throw-off lever 51 best shown in Figs. 1 and 2: Adjustably secured to the cross-shaft 89 journalled in the side-frames 13 and 14 by the set-screw 90 is the latch-arm 91 having the beveled end 92 that is adapted to engage the beveled tip 93 of the rocking valve arm 71. Fastened to the opposite end of the shaft 89 is the rock-arm 94 yieldingly connected by the coil-spring 95 with the rock-arm 96 pinned at 97 on the side-frame 14. The rock-arm 96 is connected by the link 98 with the short arm 99 fastened to the throw-off shaft 53. When this lever 51 is swung to the right (Fig. 1), the latch-arm 91 is raised in an anti-clockwise direction to engage the tip 93 of the arm 71 to hold the port 70 open; when the latch-arm 91 is released, the spring 95 allows gravity to bring these parts into their position as shown in Fig. 1, with the arm 71 free to be oscillated back and forth under the influence of the cam 82 to open and close the port 70 in predetermined relation according to the dwell of the cam 82.

Referring to Figs. 1 and 5, the blast of air to the nozzles 22 arranged across the feeder below the front edges of the bank of sheets 20 (only one being shown in Fig. 1) is supplied by the tubes 100 and 101 connected to the feed-pipe 102 leading from the air-blast pump 103 connected to the usual blowers (not shown).

The series of oscillating suction tubes or lifters used to separate or raise the front edges of the successive sheets within the effective range of the suction feed-belt 23 are best shown in Figs. 1, 2, 3 and 4: In Fig. 2 four such tubes are shown which are alike in construction and operation and are arranged in transverse alinement across the feeder within the zone of the under run of the feed-belt 23. Each tube or lifter comprises the pipe 104 terminating at its lower end with the flexible annular sucker lip 105 of rubber. Midway on the pipe 104 is the adjustable collar 106 preferably fastened to the pipe 104 by the set-screw 107 (Fig. 10). The collar 106 is pinned at 108 to the rock-arm 109 having forked ends journalled on the rock-shaft 110 pivoted in the side-frames 13 and 14.

The angular position of the pipe 104 and collar 106 relatively to the rock-arm 109 may be adjusted to suit the requirements; for this purpose the collar 106 carries the slotted sector 111 secured to the rock-arm by the set-screw 112 passing through the slotted sector 111 (Figs. 4 and 10). Adjustably secured to the rock-shaft 110 by the set-screw 113 is the rock-arm 114 having a flat tip 115 adapted to engage the flat surface 116 formed on the under side of the rock-arm 109 and yieldingly held in contact with said surface by the spring 117 pinned to the rock-arms 109 and 114.

Figs. 1 and 4 show the rock-arms 109 and 114 in coacting engagement with the suction tube 104 lifted, while Fig. 10 shows them separated as the sucker lips 105 are lowered and seizing a sheet. The spring 117 provides a yielding connection between the arms 109, 114 that prevents damage to the suction tube 104 and the sucker 105 when the latter engages the sheets, and permits travel of the arm 114 to the limit of its downward and rearward stroke regardless of the thickness of the bank of sheets 20.

Suction is intermittently created in the tube or pipe 104 through the flexible hose 118 attached to the upper end of the pipe 104 and to the valve cock 119 fastened to the cross pipe 120 fastened to the brackets 121 on the under side of the supply-table 15 (Figs. 1, 2 and 3). The ends of the cross-pipe 120 are closed by the caps 122. Fastened to the pipe 120 is the valve supply cock 123 to which is secured the suction hose 124 leading to the suction control mechanism best shown in Fig. 3. The end of the hose 124 is connected by the nipple 125 with the chambered housing 126 having the L-shaped passage 127 connected to the suction chamber 65 in the cross-pipe 62 which is connected by the hose 128 (Figs. 2 and 5) with the suction pump 129 diagrammatically shown in Fig. 5 as fastened to the side-frame 13.

The housing 126 has cut therein the horizontal bore 130 crossing the passage 127 at right angles in which bore 130 the hollow bar valve 131 is slidably keyed, said valve having the inner chamber 132 closed at its outer end by the screw-plug 133. The port 134 in the valve bar 131 connects the chamber 132 with the upper part of the passage 127 leading to the hose 124, and at the left end of chamber 132 are formed the oppositely-alined ports 135 and 136 which in one position register with the passage 127 and in their outer full line position (Fig. 3) are open to atmosphere outside the housing 126 to break the suction in the hose 124 and suction tubes 104.

The bar valve 131 is actuated to and fro in the housing 126 by the cam 137 keyed to the cam-shaft 36, the cam engaging the roller 138 pinned to the left end of the bar valve 131 (Fig. 3), the spring 139 coiled being about the bar valve 131 between the collar 140 and the housing 126 and holding the roller 138 in engagement with the cam 137.

The mechanism for actuating the suction sheet separating tubes or lifters 104 is best shown in Figs. 1, 2 and 4: Secured to the rock-shaft 110 is the arm 141 having pinned thereto the adjustable connecting rod 142 having its forward end in the form of a hook 143 to removably engage the pin 144 on the rock-lever 145 mounted on the cross-shaft 80. The forward end of the lever 145 carries the cam-roller 146 which rides on the cam 147 fastened to the cam-shaft 36, the spring 148 pinned to the rock-lever 145 and side-frame 14 (Fig. 1) holding the roller 146 in engagement with the cam 147. As shown in Fig. 2, the circular plate 149 is adjustably secured to the cam 147 to vary the drop of the cam 147 to vary the periods of rest of the suction tubes 104 as required by different grades of stock and lengths of sheets.

In Figs. 2 and 11, I have shown one of the series of stop-fingers 150 fastened to the cross bar 151 extending across the feeder which fingers 150 act as a stop to straighten the leading edges of the stock when the bank 20 moves forwardly on the feed-board 19. The guide plates 152 (only one being shown in Figs. 2 and 11) are also fastened to the bar 151 and serve to support the sheets as they are fed forwardly by the suction belt 23 to the conveyor tapes 153 (Figs. 1 and 11).

Referring to the embodiment of the invention shown in Figs. 6–9 and the mechanism thereof used to actuate the series of suction tubes 104, the collar 106 is adjustably clamped to the pin 154 mounted on the rock-arm 155 fastened to the rock-shaft 156 journalled in the brackets 157 (only one being shown in Fig. 6) mounted on the

feed-board 19. Pinned to the rock-shaft 156 is the cam-lever 158 carrying the roller 159 that rides on the heart-shaped cam 160 fastened to the cam-shaft 36 which, in this case, is mounted rearwardly of the belt 23. The suction created in the suction tube 104 through the hose 118 is controlled by a sleeve valve mechanism shown in detail in Figs. 7–9. The tube 104 has affixed thereto the cross-pipe 161 closed at its outer end and having the elongated slot 162 cut therein. Surrounding the pipe 161 is the valve sleeve 163 having the slot 164 cut therein and adapted to be rocked on the pipe 161. The valve sleeve 163 carries the boss 165 to which is secured the arm 166 adapted to be engaged and moved by the L-shaped bar 167 adjustably secured to the bracket 168 fastened on the under side of the supply-table 15 (Fig. 7). The spring 169 secured to the arm 166 and pinned to the supply-table 15 holds the arm 166 in contact with bar 167. Fig. 8 shows the valve sleeve 163 in closed position with the slots 162 and 164 out of register so as to maintain suction in the suction tubes 104, while Fig. 9 shows the two slots in register to open the tube 104 to atmosphere and so break the suction therein to release the sheet held by the suction tube. By this mechanism the suction is made and broken by the movement of the suction tubes 104 under the influence of the cam 160.

In Fig. 12 I have shown an effective means for mounting the shaft 58 of the lower rear pulley 26 so as to change the angle of the lower run of the feed-belt 23 to meet the requirements of different grades of stock, such shaft 58 being carried in the eccentric bearing 170 mounted in the supporting plate 171 (Fig. 2).

The valve cock 61 may be closed to break the suction in the suction shoe or nozzle 55, while the individual cocks 119 may be selectively closed at will to break the suction in the corresponding suction tubes or lifters 104 not utilized in the feeding of sheets of certain widths. By closing the valve cock 123, the suction may be broken in from all the tubes 104 in which case the hook 143 on the rod 142 is disconnected from the pin 144 to render the suction tubes 104 inoperative when feeding stock solely by the action of the suction belt 23 and air blast from the nozzles 22.

The operation of my improved feeder has been partially set forth in the foregoing description of the component elements comprised therein, and may be summarized as follows: The bank of sheets 20 is advanced along the feedboard 19 by the belts 16 until the leading edges of the sheets are alined across the stop fingers 150 (Fig. 11). If the bank 20 is comprised by bags or similar stock, the front marginal portion of said bank will assume a position substantially as indicated in Fig. 1. At this time suction is being created in the suction shoe 55 and an air blast issues from the nozzles 22 as shown in Fig. 1. The suction belt 23 is travelling in the direction of the arrows (Figs. 1 and 4). At the beginning of the cycle the suction tubes 104 are in their raised positions substantially as shown in full lines in Fig. 4, and suction is created in said tubes. The tubes 104 are then rocked downwardly and rearwardly by the action of the cam 147 until the suckers 105 engage and depress the front margin of the bank 20 and have yielding contact therewith through the separation of the rock arms 109 and 114 as shown in Fig. 10. The pile drag 21 presses downwardly on the bank of fanned out sheets 20, and as the tubes 104 move downwardly and rearwardly and depress the front marginal portion of the bank of sheets 20, the leading edges thereof are loosened from stop fingers 150, and the front portion of the topmost sheet is moved rearwardly and buckled. Figs. 4 and 11 show in dotted and full lines, respectively, the action of the tubes 104 at the end of their downward and rearward travel after they have depressed the front marginal portion of the bank, loosened the leading edges of the sheets from the stop fingers 150, moved the front portion of the top sheet rearwardly, and slightly buckled the front portion of said top sheet.

As the tubes 104 are moved upwardly and forwardly, they lift with the top sheet affixed to the flexible lips 105, the air blast from the nozzles 22 "winds" the top sheet and the sheet is thereby brought into effective range of the feed-belt 23 with the suction shoe 55 acting through the belt perforations 24 to seize the leading edge of the top sheet as shown in Fig. 1. As the suction tubes 104 continue to raise into the zone of the belt 23 (now holding the sheet), the suction in the tubes 104 is broken by the bar valve 131 taking its full line (Fig. 3) position under the action of the spring 139 and cam 137 to release the hold of the tubes 104 on the sheet as clearly shown in Fig. 3. The sheet now seized by the suction belt 23 is advanced over the guide plates 152 onto the sheet conveyors 153 to the machine for further operation in the usual way. The intermission of the suction created in the suction shoe 55 may be variably controlled by the cam 82 and control plate 85 as hereinbefore described, and the operator may break the suction in the shoe 55 and stop the action of the feed-belt 23 and suction tubes 104 by moving the hand lever 51 to the right in Fig. 1 so as to allow the latch arm 91 engage the tip 93 of the valve arm 71 while shifting the clutch collar 37 to the left (Fig. 2) to disengage the bevel gears 38 and 39 to throw the feeder out of operation.

In the embodiment of my invention shown in Figs. 6–9, the operation is substantially the same as above set forth except that the heart-shaped cam 160 actuates the suction tubes 104 in bringing the top sheet into effective range of the suction belt 23, the shifting of the collar 106 on the lever 155 enabling the tubes 104 to be variably positioned to meet the requirements of different grades of stock.

The suction created in the tubes 104 is controlled by the arm 166 engaging the bar 167 as indicated in Figs. 8 and 9, and the duration of the suction may be varied by shifting the vertical position of the bar 167 in the bracket 168. Fig. 8 shows the tubes 104 with the slot 162 closed by the sleeve 163 so as to maintain suction in said tubes, while Fig. 9 shows the slots 162 and 164 in register to break the suction in the tubes 104.

The foregoing construction embodies the underlying principles of my invention, but various changes or modifications may be made in the structural details without departing from the scope of my improvements. However the foregoing is sufficient to disclose the basic principles and advantages of my invention as installed in a sheet-feeder of the continuous type.

I claim as my invention:

1. In a sheet feeder, upper and lower means for feeding a bank of fanned out sheets, a continuously driven perforated belt for advancing a sheet from said bank and extending between upper and lower front portions thereof, means for creating suction through the continuously

driven perforated belt whereby the same may grip the sheet and advance it as aforesaid, and oscillating suction means disposed adjacent the belt between said portions of the bank for buckling and separating the front edge portion of the sheet from the bank and carrying said portion within the range of action of the first named suction means and said continuously driven perforated belt.

2. In a feeder for a bank of fanned out sheets, a driven perforated belt for advancing a sheet from the bank, means for creating suction through said belt whereby the same may grip the sheet and advance it as aforesaid, and means for initially separating the sheet from the bank and for rising the sheet within the range of action of said suction means and said belt, said last named means including an oscillating sheet engaging device adapted to move downwardly and rearwardly during part of its cycle of operation to buckle the sheet and thereby initially separate it from the bank.

3. In a feeder for a bank of fanned out sheets, a driven perforated belt having suction created therethrough and adapted to advance a sheet from said bank, and means for initially separating the sheet from the bank and for carrying the sheet therefrom within the range of action of the belt, said means including a suction sheet engaging device swinging downwardly and rearwardly to initially separate the sheet from the bank and swinging upwardly and forwardly to carry the sheet within the range of action of said belt.

4. In a feeder for a bank of fanned out sheets, a driven perforated belt having suction created therethrough and adapted to feed a sheet from said bank, means engaging the bank of fanned out sheets, and an oscillating suction sheet engaging device swinging downwardly and rearwardly to initially separate the sheet from the bank and swinging forwardly and upwardly to carry said sheet within the range of action of said belt.

5. In a sheet feeder, means for feeding a bank of fanned out sheets, stop means against which the sheets are fed by said first named means, bank engaging means, and oscillatory suction sheet separating means swinging downwardly and rearwardly during part of its cycle of operation so as to move the topmost sheet of the bank rearwardly out of contact with said stop means.

6. In a sheet feeder, means for feeding a bank of fanned out sheets, stop means against which the sheets are fed by said first named means, a driven perforated belt having suction created therethrough and adapted to advance a sheet from said bank, bank engaging means, and oscillatory suction sheet separating means swinging downwardly and rearwardly to move the sheet rearwardly out of contact with said stop means, said oscillatory suction means then moving upwardly and forwardly to carry said sheet within the range of action of said belt.

7. In a sheet feeder, a driven perforated belt having suction created therethrough and adapted to feed a sheet, oscillatory suction means for carrying the sheet within the range of action of said belt, and rocking operating means for the oscillatory suction means and on which the latter is yieldably mounted.

8. In a sheet feeder, a driven perforated belt having suction created therethrough and adapted to feed a sheet, suction means for carrying the sheet within the range of action of said belt, oscillating means carrying and rocking the suction means, and means for adjusting said suction means angularly to various positions on said oscillating means.

9. In a sheet feeder, a driven perforated belt having suction created therethrough and adapted to feed a sheet, a rock shaft having a pair of arms one fixed on the shaft and the other loose thereon, means yieldably connecting said arms, and suction means on one of the arms and adapted to carry said sheet within the range of action of said belt.

10. In a sheet feeder, means for feeding a bank of fanned out sheets, a driven perforated belt having suction created therethrough and adapted to advance the sheets one after another from the fanned out bank, and means for varying the line of travel of said belt relative to said bank.

11. In a sheet feeder, suction sheet feeding means, reciprocating suction means for carrying the sheets within the range of action of the suction sheet feeding means, a source of suction for the sheet feeding means, a separate source of suction for the reciprocating suction means, a pair of suction controlling valves each interposed between one of said sources and one of said means, and means for operating said valves at predetermined intervals.

12. In a sheet feeder, suction sheet feeding means, reciprocating suction means for moving a sheet within the range of action of said sheet feeding means, a source of suction, a conduit connecting the source of suction with the reciprocating suction means, a valve housing spring operated in one direction forming part of the conduit, a valve in said housing and controlling communication of said reciprocating suction means with atmosphere and said source of suction, and means for operating said valve in the opposite direction and comprising a driven cam engaging the stem thereof.

13. In a sheet feeder, suction sheet feeding means, oscillating suction means for moving a sheet within the range of action of said sheet feeding means, a source of suction, a conduit connecting the source of suction with the oscillating suction means, a valve housing forming part of the conduit, a valve extending in the housing transversely of the conduit and controlling communication of the oscillating suction means with atmosphere and the source of suction, and means for reciprocating said valve to alternately establish communication of said oscillating suction means with atmosphere and said source of suction respectively.

14. In a sheet feeder, suction sheet feeding means, oscillating suction means for moving a sheet within the range of action of said sheet feeding means, a source of suction, a conduit connecting the source of suction with the reciprocating suction means, a valve housing forming part of the conduit, a tubular valve in said housing and having spaced transversely extending ports controlling communication of the reciprocating suction means with atmosphere and said source of suction, and means for operating said valve to open and close said ports to atmosphere and said source of suction respectively.

15. In a sheet feeder, suction sheet feeding means, oscillating suction means for moving a sheet within the range of action of said sheet feeding means, a source of suction, a conduit connecting the source of suction with the oscillating suction means, a valve housing forming part of the conduit, a tubular slide valve extend-

ing in the housing transversely of the conduit and having a pair of spaced ports one movable into and out of the housing and the other continuously confined therein, but movable into and out of the conduit, and means for reciprocating said valve whereby said ports are opened and closed to atmosphere and said source of suction respectively at predetermined intervals.

16. In a sheet feeder, means for feeding a bank of fanned out sheets, stop means against which the sheets are fed by said first named means, a driven perforated belt having suction created therethrough and extending between upper and lower parts of the bank to advance sheets one after another therefrom, and oscillating suction means between said parts of the bank and moving in one direction to engage and move the front edge portion of a sheet rearwardly out of contact with said stop means, said oscillating suction means then moving in the opposite direction to carry said edge portion within the range of action of said belt.

HARRY EHLIG.

CERTIFICATE OF CORRECTION.

Patent No. 2,010,586. August 6, 1935.

HARRY EHLIG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 44, strike out the word "from"; page 5, second column, lines 34-35, claim 12, strike out the words "spring operated in one direction" and insert the same after "housing" in line 36, of said claim; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of September, A. D. 1935.

Leslie Frazer
Acting Commissioner of Patents.

(Seal)