April 28, 1925. 1,535,215

H. EHLIG

SHEET FEEDER

Filed Nov. 25, 1922 3 Sheets-Sheet 1

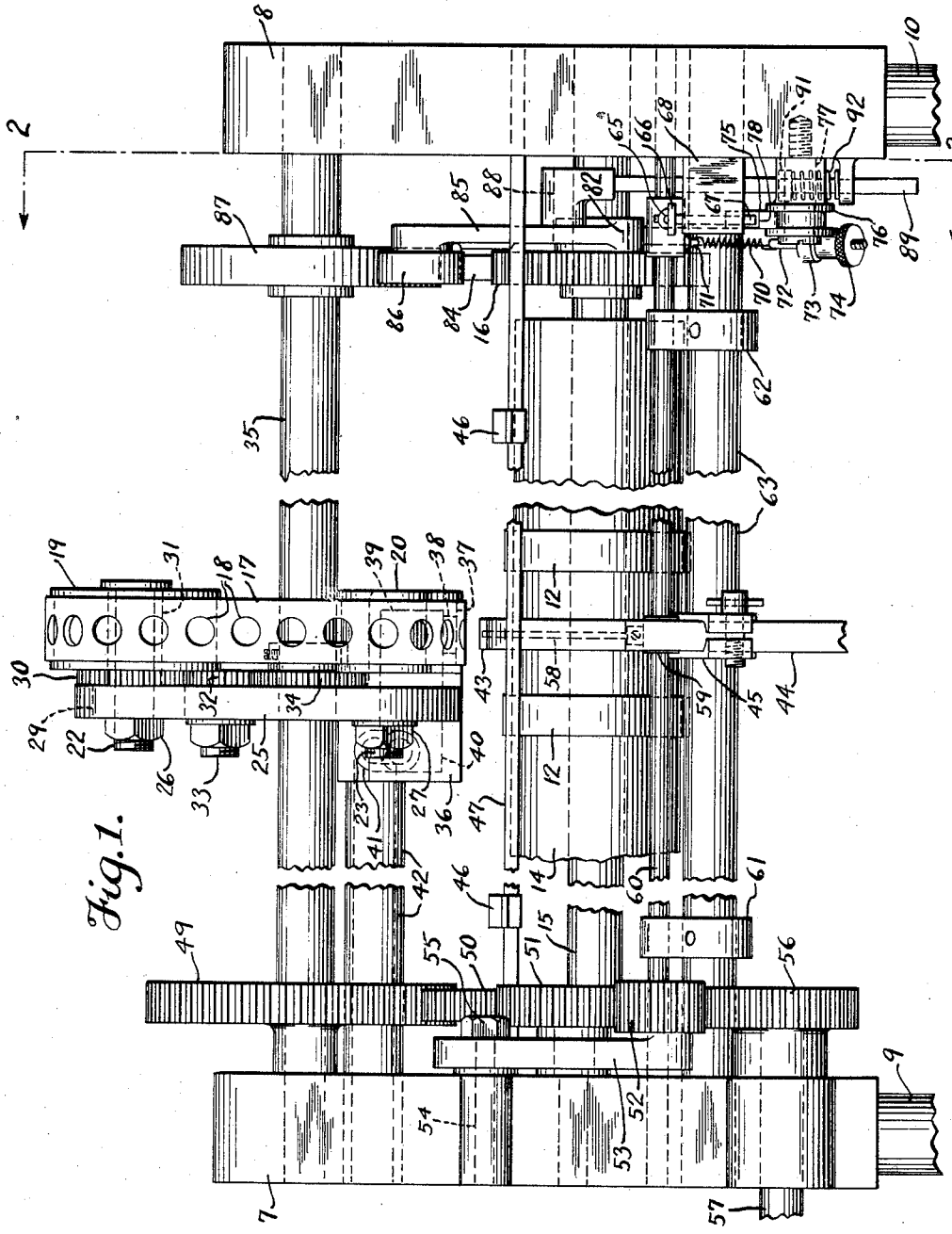


Fig. 1.

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3 Sheets-Sheet 2

Fig.2.

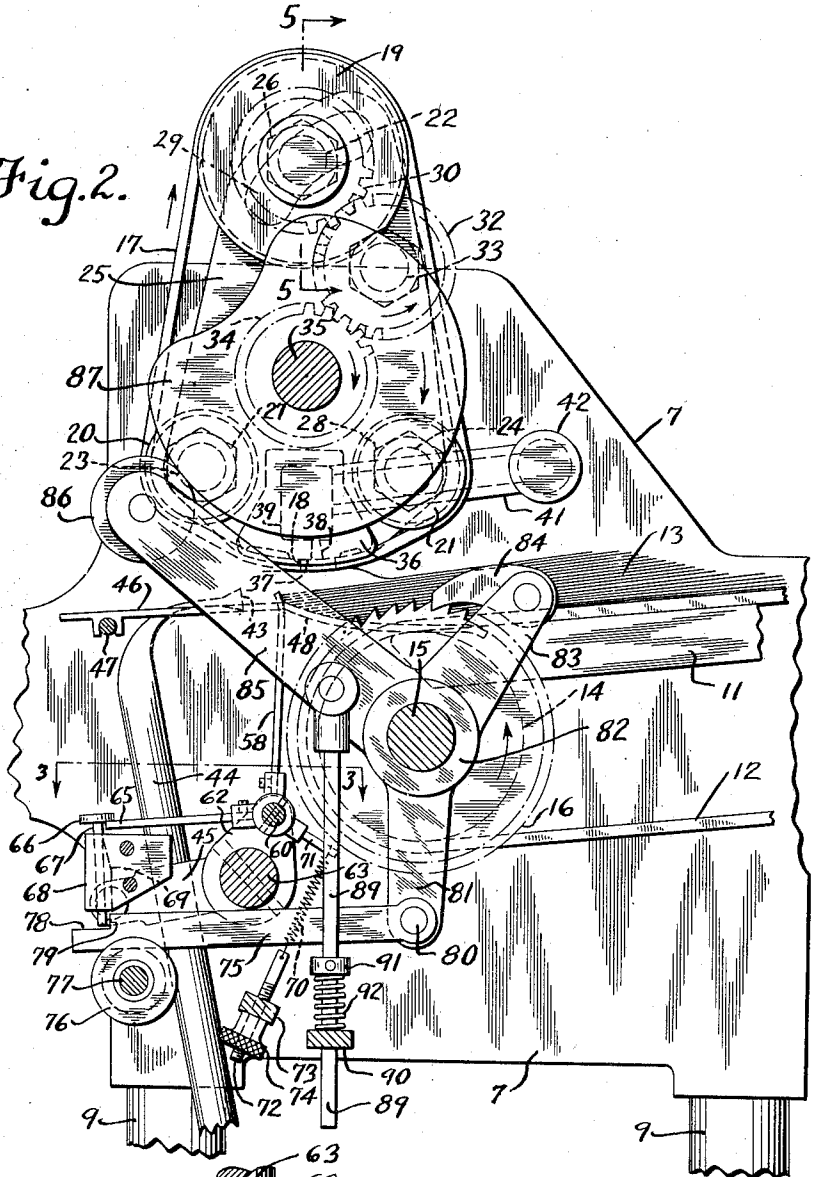
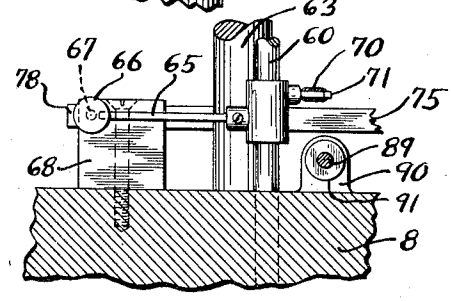


Fig.3.



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Filed Nov. 25, 1922 3 Sheets-Sheet 3

Fig. 6.

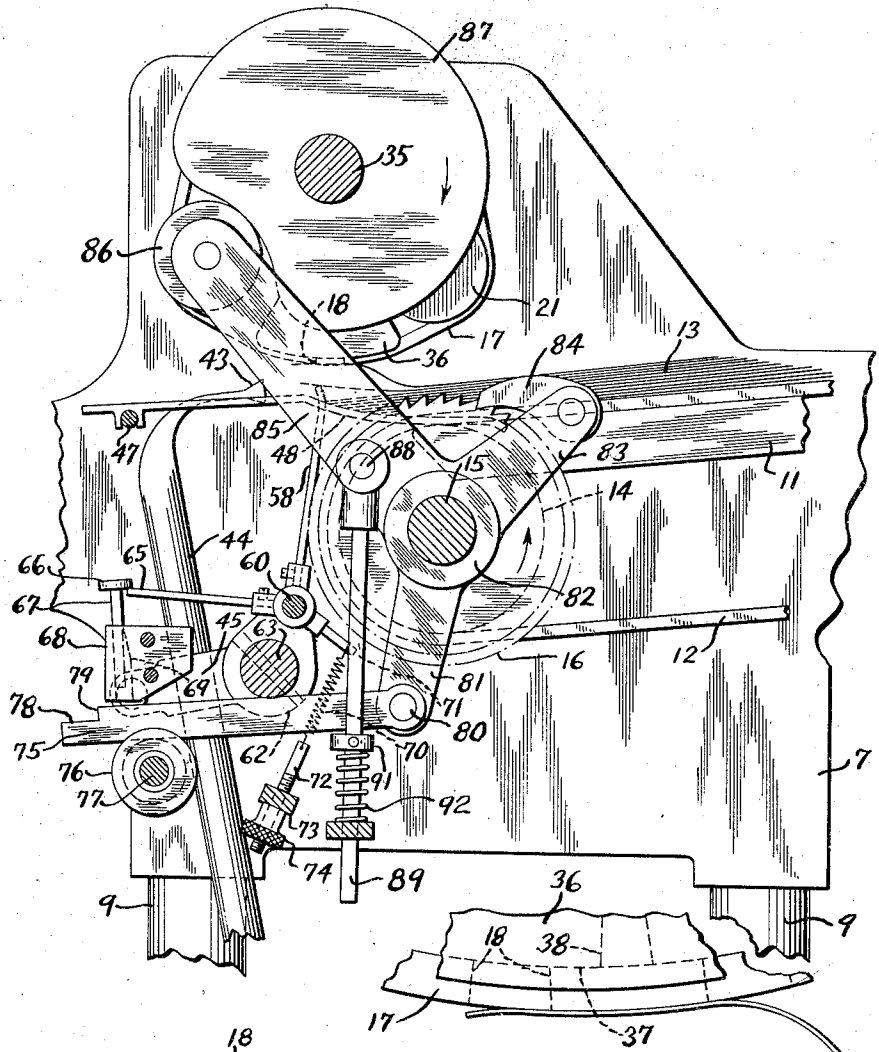


Fig. 5.

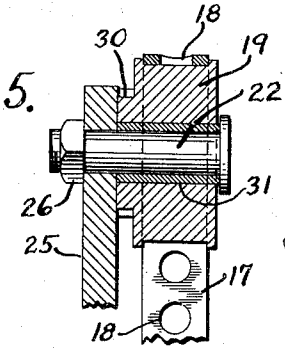
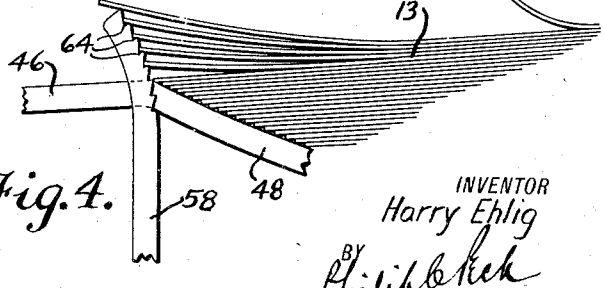


Fig. 4.



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UNITED STATES PATENT OFFICE.

HARRY EHLIG, OF PEARL RIVER, NEW YORK, ASSIGNOR TO GEORGE R. SWART & COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SHEET FEEDER.

Application filed November 25, 1922. Serial No. 603,163.

To all whom it may concern:

Be it known that I, HARRY EHLIG, a citizen of the United States, and a resident of Pearl River, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Sheet Feeders, of which the following is a specification, reference being made to the accompanying drawings, forming a part thereof.

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 other things, mainly to provide a sheet-feeder of this character having a simplified design which will have embodied therein separate mechanisms capable of performing efficient work, while they are not likely to get out of order, yet are very sensitive in action, all being incorporated in a feeder which will invariably separate and continuously feed or advance the successive sheets, preferably from a fanned-out bank of paper on the feed-board, both automatically and with great rapidity. With this aim in view, I have devised a continuous front-edge feeder which will separate and feed the sheets in a continuous flow by devices operating on the front portion or margins of the stacked-up sheets, the sheet forwarding mechanisms for the bank of sheets being controlled by the variable pressure or weight of the front margins of the fanned-out bank supported on the feed-board beneath the feeding-off devices.

Another object of my invention is to provide an improved suction feeding-off device for continuously separating and advancing the successive sheets, combined with a novel detector mechanism, controlled by the forward pressure of the bank which will operate independently of the suction feeding-off device and also independently of the number or timing of the individual sheets separated thereby, which mechanism controls and inaugurates the action of the bank or pile feed devices through the continued operation of the sheet-feeder itself, whereby the paper sheets may be advanced and maintained at the requisite thickness beneath the feeding-off device operating at the front margins of such sheets, the forward pressure of these front margins controlling the operation of the bank feed.

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 embodiment 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.

Of the drawings, Fig. 1 is a front elevation looking from the left in Fig. 2, certain parts of the feeder being omitted;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 2, showing a part of the stop mechanism for controlling the action of the bank feed devices;

Fig. 4 is an enlarged detail view showing the relation of one of the detector fingers bearing against the front margins of the top sheets in the bank in the position shown in Fig. 2;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 2 looking in the direction of the arrows; and

Fig. 6 is a side view similar to that of Fig. 2, showing the pawl-carrying ratchet arm as having been rocked preparatory to advance the bank feed belts.

Similar numerals refer to similar parts throughout the several figures.

Referring to Figs. 1, 2 and 6, the two side frames 7 and 8 of the feeder proper are supported on the standards 9 and 10 respectively; between the side-frames 7 and 8 and affixed thereto is the lower feed-board 11 over which travel a series of feed belts 12 to advance the bank of sheets 13 along the feed-board 11. The belts 12 pass around the drum 14 fast to the transverse shaft 15 journalled in the side-frames 7 and 8 as shown in Fig. 1. The shaft 15 carries the

ratchet 16 by which the feed-belts 12 are intermittently advanced over the feed-board 11 to carry the bank of fanned-out sheets 13 to the separating and feeding-off devices.

In the present embodiment the sheet separating and advancing devices comprise an endless loop belt 17 having spaced-apart perforations 18 (Fig. 1) which passes around three flanged pulleys 19, 20 and 21 journalled on stub-shafts 22, 23 and 24 respectively removably secured to the plate 25 by screw-nuts 26, 27 and 28 respectively. The stub-shaft 22 for the top pulley 19 is adjustably secured in the arcuate slot 29 so as to take up any slack in the belt 17, whenever required. Affixed to the top-pulley 19 is the gear 30, both pulley and gear being rotatably mounted on the sleeve 31 (Fig. 5); the pulleys 20 and 21 are similarly mounted on their respective shafts 23 and 24. The gear 30 meshes with the gear 32 journalled on the stub-shaft 33 removably secured to the vertical supporting plate 25 by the screw-nut, such gear 32 engaging with the gear 34 fast on the transverse shaft 35 journalled in the side frames 7 and 8 (Fig. 1). The plate 25 is sleeved on the shaft 35 and is supported by the suction nozzle 36 affixed to the plate 25, the nozzle 36 having a wide curved face 37 (Figs. 2 and 4) against which the inner surface of the loop belt 17 is pressed. The face 37 has the port 38 formed therein connected by the passage-way 39 with the hollow chamber 40 and tube 41 with the transverse pipe 42 fixed to the side frame 7 as shown in Figs. 1 and 2. The port 38 is arranged to intermittently register with the successive perforations 18 in the belt 17. The required suction to operate the belt 17 is applied to the pipe 42 by any suitable air-exhausting means not shown. The sheets from the bank 13 adhere to the exterior surface of the perforated belt 17 opposite the nozzle 36 and are separated and advanced to the usual feed-rollers (not shown) by the belt 17 moving in a clockwise direction as shown in Fig. 2.

The front edges of the sheets comprising the bank 13 are kept separated by a blast of air from the nozzle 43 mounted on the pipe 44 adjustably secured to the bracket 45 (Fig. 1), which pipe is connected with any suitable air pump not shown; the sheets then pass over the guide plates 46 (two being shown in Fig. 1) mounted on the tie rod 47, the plates 46 having curved extensions 48 upon which the front margins of the sheets rest (Fig. 4) at the forward end of the feed-board 11.

The shaft 35 is constantly rotated in a clockwise direction (Figs. 2 and 6) by the gear 49 affixed to such shaft 35 (Fig. 1). The gear 49 meshes with the idler gear 50 which coacts with gear 51 and the gear 51 engages gear 52 journalled on bracket 53 removably secured to the frame 7 by the bolt 54 and nut 55. The gear 52 meshes with the gear 56 secured to the power shaft 57 which is driven from any suitable source of power not shown.

The detector mechanism which controls and inaugurates the action of the bank feed independently of the action of the suction loop belt 17 in feeding the sheets from the bank 13 is best shown in Figs. 1, 2 and 6 and comprises the detector fingers 58 (only one being shown for clearness) adjustably mounted on the collar 59 (Fig. 1) affixed to the rock-shaft 60 journalled in the brackets 61 and 62 pinned to the tie-shaft 63 secured in the side-frames 7 and 8. The tips of fingers 58 have a series of teeth 64 formed therein to hold the front edges of the upper sheets spaced-apart after being winded from the air-nozzle 43 as shown in Fig. 4, and as such sheets bear against the finger 58. The shaft 60 also adjustably carries the arm 65 which engages beneath the head 66 of the pin 67 slidably mounted in the block 68 affixed to the frame 8 (Fig. 3). The block 68 has the tapered hole 69 cut therein through which the pin 67 slides freely by gravity. When the pin 67 is in its lower position (Fig. 2), its tip projects below the under surface of the block 68; when the pin 67 is raised (Fig. 6), the pin tip is withdrawn within the hole 69. The pin 67 is normally held in its raised position against gravity by the light coil spring 70, one end of which is affixed to the lever arm 71 secured to the shaft 60 (Fig. 3) and with its lower end fast to the upper end of the screw-threaded pin 72 slidably held in the bracket 73 affixed to the side-frame 8 (Figs. 2 and 6) by the thumb screw-nut 74 by which the tension or pull of the spring 70 on the arm 71 may be regulated according to the variable pressure or weight of the front margins of the sheets of any particular weight or thickness bearing against the finger 58 (Fig. 4).

Beneath the inner end of the block 68 is the laterally-moving slide-bar 75 resting on the flanged roller 76 journalled on the stub-shaft 77 secured to the frame 8. The forward end of the slide-bar 75 is formed with the cut-out part 78 in its upper surface providing the shoulder 79 back of the tip of the pin 67 when the latter is in its lowered position as shown in Fig. 2. The bar 75 is pivoted at 80 to the lower arm 81 of the bell crank lever 82 rotatably mounted on the shaft 15; the short arm 83 carries the pawl 84 which coacts with the ratchet 16 fast on the shaft 15 while the longer arm 85 of the lever 82 carries the cam-roller 86 to engage with the cam 87 secured to the shaft 35. Depending from the pin 88 on the arm 85 is the rod 89 which slides through the

bracket 90 secured to the frame 8; between the bracket 90 and collar 91 adjustably secured to the rod 89 is the expansion spring 92 coiled about the rod 89. Fig. 2 shows the position of the pawl 84 when the cam-roller 86 is riding upon the high part of the cam 87 with the spring 92 under compression; Fig. 6 shows the pawl 84 retracted by the release of the spring 92 when the roller 86 is free to enter the drop of the cam 87, and the slide-bar 75 in its released forward position.

The operation of my sheet-feeder is substantially as follows: When the loop belt 17 is constantly revolving in a clockwise direction (Fig. 2) and is normally separating and advancing the top sheets from the bank 13 (Fig. 4), in conjunction with the air-blast from the nozzle 43, the pressure or weight of the front margins of the upper sheets partially supported on the guide-plate extensions 48 (Fig. 4) is sufficient to rock or swing forwardly the finger 58 in the rock-shaft 60 against the tension of the spring 70 which allows the pin 67 to fall by gravity to its Fig. 2 position in which the pin-tip projects into the cut-out part 78 of the slide-bar 75 slightly in advance of the shoulder 79, the arrangement of the parts of this stop mechanism being such that when the cam-roller 86 is riding on the dwell of the cam 87, the shoulder 79 is just to the rear of the pin 67 which, however, holds the bar 75 in its Fig. 2 position when the roller 86 is passing over the drop of the cam 87. When the revolving loop belt 17 has separated and advanced the top sheets from the bank 13 over the guide plates 46 to the feeding-off rollers, and the thickness of the bank 13 is thereby diminished so that it becomes desirable or necessary to advance the bank or pile of sheets by moving the feed-belts 12 or the feed-board 11, the pressure or weight of the diminishing top sheets bearing on the finger 58 becomes less than the tension of the spring 70, and such finger is swung rearwardly to the position shown in Fig 6. Such rearward movement of the finger 58 raises the pin 67 and frees the slide-bar 75 while releasing the bell-crank lever 82 which is rocked in a clockwise direction from the Fig. 2 to the Fig. 6 position when the cam 87 has rotated sufficiently to allow the cam-roller 86 to enter the drop of the cam 87 (Fig. 6), and the pawl 84 is simultaneously drawn backwardly over the teeth of the ratchet 16. When the lever 82 is rocked in an anti-clockwise direction by the roller 86 riding out of the drop of the cam 87, the ratchet 16 rigidly secured to the shaft 15 will advance the feed-belts 12 to forward the bank of sheet. Such bank-feed movement through this pawl and ratchet mechanism will be repeated with each revolution of the cam 87 until the pressure of the front edges of the top sheets in the bank of sheets bearing with their front margins on the finger 58 is sufficient to rock forwardly the finger 58 to its Fig. 2 position against the tension of the delicate spring 70, which movement allows the pin 67 to fall by gravity so that its tip will again rest in the cut-out part 78 and ahead of the shoulder 79 to prevent further oscillations of the bell-lever 82; in short the cam-roller 86 will ride only on the dwell of the cam 87 and bridges the drop because the pin 67 prevents a forward movement of the slide-bar 75 and the coil spring 92 is held under compression as shown in Fig. 2. Such detector control and stop mechanism is very sensitive in action and may be variably adjusted according to the weight of the stock being fed.

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 continuous sheet-feeder, a constantly moving suction feed-belt for advancing the successive sheets from the front margin of the bank by applying suction continuously thereto.

2. In a continuous sheet-feeder, a constantly moving suction feed-belt for advancing the successive fanned out sheets from the front margin of the bank by applying suction continuously therto.

3. In a continuous sheet-feeder, an endless constantly moving suction feed-belt for advancing the successive sheets from the front margin of the bank by applying suction continuously thereto.

4. In a continuous sheet-feeder, an endless constantly moving suction feed-belt for advancing the successive fanned-out sheets from the front margin of the bank by applying suction continuously thereto.

5. In a continuous sheet-feeder, an endless constantly moving suction belt operating on the front margin of the bank by applying suction continuously thereto for continuously separating and advancing the successive sheets.

6. In a continuous sheet-feeder, an endless constantly moving suction belt operating on the front margin of the fanned-out bank by applying suction continuously thereto for continuously separating and advancing the successive sheets.

7. In a sheet-feeder, a feed-board, means for advancing a pile or bank of sheets along said feed-board, and a constantly moving suction feed-belt operating on the front

margins of the sheets by applying suction continuously thereto for continuously separating the successive sheets.

8. In a sheet-feeder, a feed-board, means for intermittently advancing a pile or bank of sheets along said feed-board, and a constantly moving suction feed-belt operating on the front margins of the sheets by applying suction continuously thereto for continuously separating the successive sheets.

9. In a continuous sheet feeder, an endless, constantly moving, loop suction feeding-off device operating on the front top portion of the fanned-out bank of sheets by applying suction continuously thereto for separating and advancing the successive sheets.

10. In a continuous sheet-feeder, an endless loop suction feeding-off device arranged adjacent the top portion of the fanned-out bank of sheets and means for constantly revolving said device while applying suction continuously thereto for separating and advancing the successive sheets.

11. In a continuous sheet-feeder, an endless loop suction feeding-off device arranged adjacent the top portion of the fanned-out bank of sheets and means for constantly revolving said device while continuously applying suction thereto for continuously separating and advancing the successive sheets.

12. In a continuous sheet-feeder, an endless loop suction feeding-off device arranged adjacent the top portion of the fanned-out bank of sheets and means for constantly revolving said device in the forward direction while applying suction continuously thereto for separating and advancing the successive sheets.

13. In a continuous sheet-feeder, an endless loop suction feeding-off device arranged adjacent the top portion of the fanned-out bank of sheets and means for constantly revolving said device in the forward direction while continuously applying suction thereto for continuously separating and advancing the successive sheets.

14. In a continuous sheet-feeder, a constantly moving suction feed-belt for advancing the successive sheets from the front margin of the bank by applying suction continuously thereto, and means for tightening the tension of said feed-belt.

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