

Aug. 1, 1933.

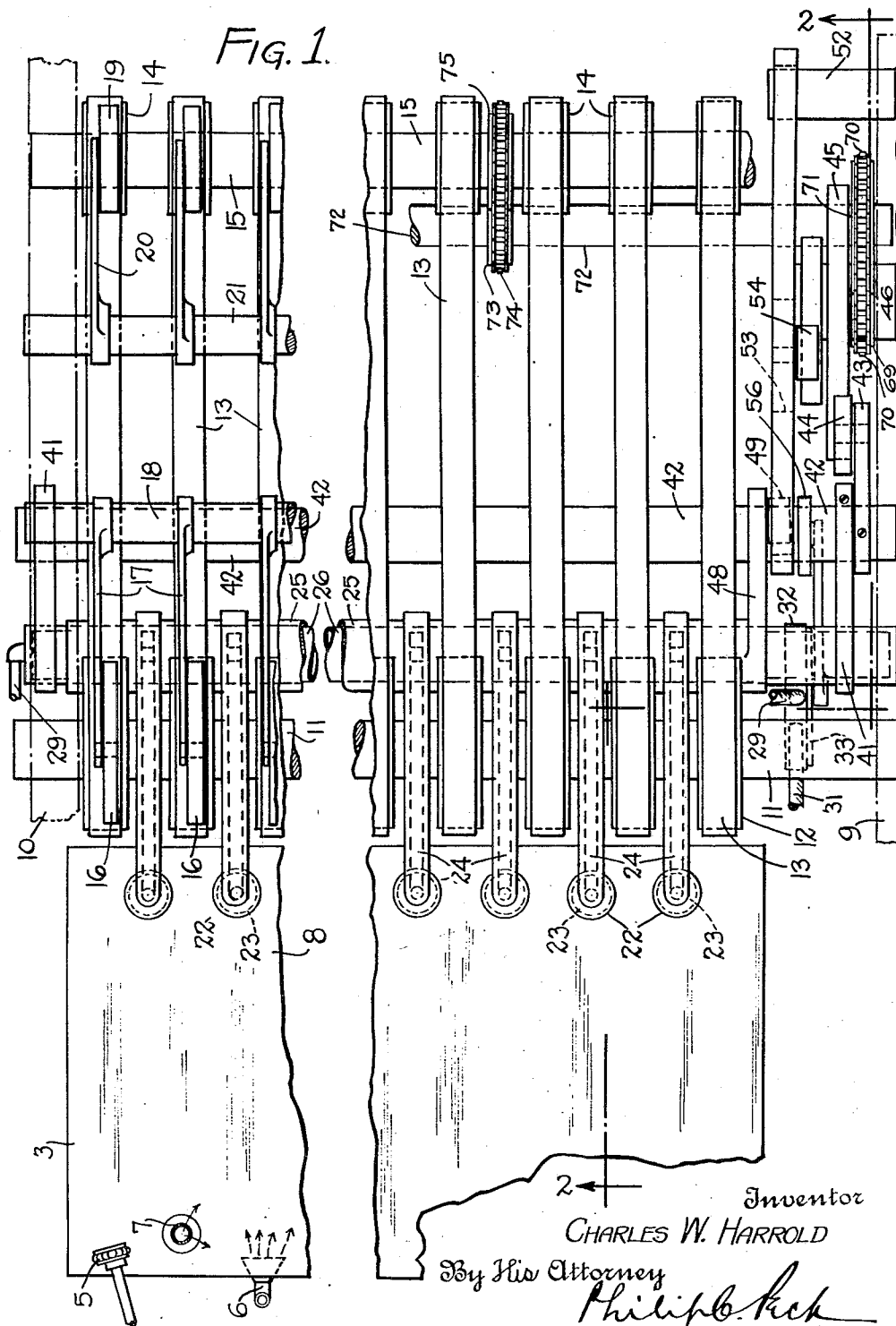
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SHEET FEEDER

Filed Nov. 19, 1930

2 Sheets-Sheet 1



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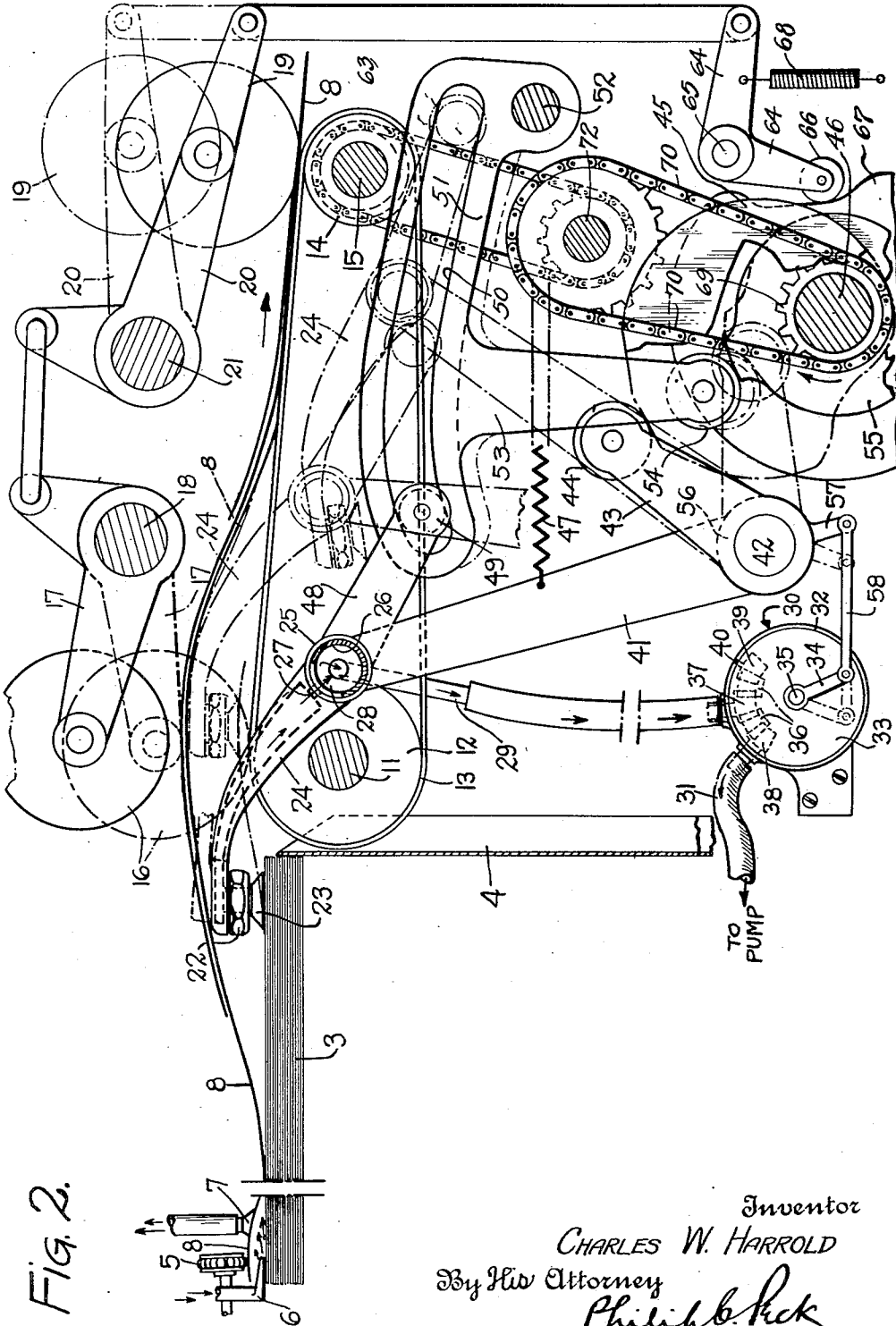
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UNITED STATES PATENT OFFICE

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SHEET-FEEDER

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Application November 19, 1930
Serial No. 496,616

REISSUED

20 Claims. (Cl. 271—30)

My invention relates to sheet separating and advancing mechanisms for automatic sheet-feeders, and more particularly to suction sheet-separating devices in front edge feeders especially when equipped for use in the pile sheet-feeders of the type shown in the U. S. Charles G. Harris Patent No. 1,112,609 of October 6, 1914.

The objects of my invention are, among other things, to provide an improved and simplified front edge feeder of the suction type which embodies a series of oscillating suckers that engage and raise slightly the front edge of the top sheet on a pile and draw same forwardly to the feed-rolls of the printing-press or other machine to which the sheet-feeder is attached. After the sheet has been seized by the feed-rolls, the suckers are swung forwardly in unison and drop beneath the plane of the advancing sheet and the sheet moves forwardly into the bite of a second pair of feed-rolls and is further advanced forwardly into the press. When the suckers are retracted to engage the next sheet they pass below the first sheet that is being forwarded with the first pair of feed-rolls lifted out of the way of the returning suckers.

With these and other objects in view, my invention comprises the constructions and operating parts forming the sheet-feeder herein shown and hereinafter to be described as a preferred embodiment of my invention which is also readily adapted to any form of pile-feeder and is not to be restricted to the type shown in the C. G. Harris Patent No. 1,112,609 issued as aforesaid.

In the drawings, Fig. 1 is a top plan view of my improved feeder; and

Fig. 2 is a sectional elevation taken on the line 2—2 of Fig. 1.

Similar numerals refer to similar parts throughout the several figures.

Referring to the drawings, the pile of paper 3 is supported on the standards 4, and at each of the rear corners of the pile 3 is located the combining buckler and sheet separating unit (only one being shown), as more particularly shown and described in the C. G. Harris Patent No. 1,112,609, comprising the combining buckler wheel 5 which is rotated to frictionally engage the top portion of the pile 3 at its rear corners to produce a series of traveling arcs or buckles in the topmost and subjacent sheets, the sheets being held against bodily movement by the adjacent presser-foot 6. While the paper buckles are so held by the buckler wheel 5 and presser-foot 6, the suction separator 7 is lowered to seize the topmost sheet 8, and is then raised with the sheet 8 after which the

buckler wheel 5 is lifted (Fig. 2) and the presser-foot 6 is thrown outwardly and then inwardly again to engage the pile 3 beneath the top sheet 8, and simultaneously blasts of air are projected beneath the sheet 8 whereby it is "winded" from the pile 3 to allow my improved front edge feeder mechanisms to seize the top sheet 8 and advance same forwardly (to the right in Fig. 2).

The side-frames 9 and 10 carry the rotatable cross-shaft 11 on which are fixed spaced-apart pulleys 12 around which pulleys 12 pass the looped travelling feed-tapes 13 that also encircle the forward series of spaced-apart pulleys 14 mounted on the shaft 15 journaled in the side-frames 9 and 10. Coacting with pulleys 12 and tapes 13 are a like series of drop-rolls 16 pivoted on the arms 17 affixed to the rock-shaft 18, and a similar set of drop-rolls 19 pivoted to the arms 20 which are affixed to the rock shaft 21 coact with the pulleys 14 and feed-tapes 13. The drop-rolls 16 and 19 are raised and lowered by the following mechanism: Fastened to the shaft 18 is the rock-arm 59 connected by the link 60 to the rock-arm 61 affixed to the rock-shaft 21. Pinned to the extension 62 of one of the arms 20 is the link 63 pivoted to the rock-lever 64 journaled on the stud 65 and carrying the cam-roller 66 that rides on the cam 67 affixed to the cam-shaft 46 by the force of the pull-spring 68. As the cam 67 revolves and the roller 66 rides out of the drop of the cam 67, the drop-rolls 16 are lowered to their dotted line position to engage the sheet while the drop-rolls 19 are raised. When the roller 66 enters the drop of the cam 67 a reverse complementary movement of the rolls 16 and 19 takes place. In the drawings the rolls 19 are shown to have a reciprocating movement, but, if so desired, they may serve as continuous advancing rolls always in contact with the tapes 13 as shown in full lines in Fig. 2.

The row of suction heads 22 (six being shown in Fig. 1) are similar in structure and operation and a description of one such head 22 will suffice for all. The head 22 is hollow and carries the usual rubber sucker lips 23 which engage and attach themselves to the top sheets when an exhaust or vacuum pressure exists in the head 22. The heads 22 are mounted on the ends of hollow arms 24 spaced between the pulleys 12 (Fig. 1) and affixed to the tubular shaft 25 rotatably sleeved over the inner hollow shaft 26. The port 27 in the shaft 25 is adapted to register with the slot 28 in the shaft 26 to provide a suction passage from the interior of the shaft 26 to the suction heads 22. The end of the shaft 26 is connected

by the pipe or hose 29 to the valve box 30 which is connected by the hose 31 to the customary vacuum pump (not shown).

The valve box 30 comprises the inner chamber 37 cut out of the circular back plate 32 suitably affixed to the feeder as shown in Fig. 2. Fitted to the plate 32 is the oscillating plate 33 which carries the rock arm 34 on the stud 35 affixed to the plate 33. The plate 33 has the cut-out passage 36 which registers with the cut out slots 37 and 38 to provide a direct connection with the hose 29 and hose 31 respectively when the rock arm 34 and plate 33 are in the full line position shown in Fig. 2. When the rock arm 34 is shifted clockwise to its dotted line position the cut-out passage 36 in the plate 33 registers with the slot 37 and chamber 39 which has the vent 40 to atmosphere thereby shutting off the pump from the hose 29 and breaking the suction or exhaust pressure in the suction heads 22. Any other type of device for intermitting the suction derived from the usual vacuum pump in the suction heads 22 may be employed. The present embodiment is shown because of its simplicity in structure and operation.

The hollow shaft 26 is pivotally mounted at either end on the rock arms 41 affixed to the rock-shaft 42 journaled in the side-frames 9 and 10 (Fig. 1). Affixed to the shaft 42 is the arm 43 carrying the cam-roller 44 that coacts with the cam 45 mounted on the cam-shaft 46 which is rotated in the direction of the arrow (Fig. 2) by any suitable means (not shown). The spring 47 between the rock arm 41 and any convenient fixed part of the feeder (not shown) holds the cam-roller 44 on the cam 45 as the latter revolves in a clockwise direction.

The outer tubular shaft 25 on which the sucker arms 24 are mounted carries the arm 48 to which is pinned the cam-roller 49 that engages the cam-slot 50 cut in the elongated oscillating bracket 51 pivoted at one end of the stud 52.

The bracket 51 carries the depending arm 53 to which is pinned the cam-roller 54 that engages the cam 55 mounted on the cam-shaft 46 to impart an up-and-down movement to the bracket 51 as indicated in dotted lines in Fig. 2. The collar 56 affixed to the rock-shaft 42 carries the arm 57 connected by the link 58 to rock-arm 34 to intermit the suction as hereinbefore described in timed relation with the forward and backward swinging movement of the suction heads 22. The proper driving speed relation between the drive cam-shaft 46 that operates the suction heads 22 and the rotating shaft 15 that actuates the travelling feed-tapes 13 so that the suction heads 22 will oscillate at all times beneath the previously fed-off sheets is maintained by the following mechanism: The cam-shaft 46 carries the sprocket 69 around which passes the endless drive chain 70 engaging and driving the large sprocket 71 fast to the cross-shaft 72 journaled in the side-frames 9 and 10. The shaft 72 has also affixed thereto the small sprocket 73 around which passes the endless chain 74 that engages and drives the sprocket 75 fastened to the feed-tape shaft 15. By this mechanism the top sheets 8 are so advanced by the feed-tapes 13 and associated devices that the suction heads 22 will be actuated at all times beneath the previously fed-off sheets moving to the right in Fig. 2 as indicated by the arrow.

The operation of my front-edge sheet-feeder is substantially as follows: When the combing wheel 6 and suction separator 7 have lifted to

loosen and raise the rear corners of the top sheet 8 on the pile 3 as shown in Fig. 2, the row of suction heads 22 on their supporting arms 24 are in their full line sheet-engaging position with the rock-arm 41 in its retracted position and the cam-roller 49 in the left end of the cam-slot 50, the cams 45 and 55 having been set on the cam-shaft 46 relatively to each other as shown in full lines in Fig. 2. The collar 56 has also been set on the rock shaft 42 so that the rock arm 34 which controls the suction from the pump through the valve-box 30 is in its full line position to afford a direct exhaust pressure or suction in the suction heads 22 arranged across the front margin of the pile 3. The sucker lips 23 engage and seize the top sheet 8 and lift same slightly; then as the arm 41 swings forwardly as the rock-shaft 42 moves clockwise, the suction heads 22 carry the front edge of the sheet 8 into the bite of the upraised feed-rolls 16 (shown by dotted lines in Fig. 2); then the rolls 16 are lowered by the cam roller 66 riding out of the drop of the cam 67 to press the front portion of the sheet against the travelling feed-tapes 13 at which time the rock arm 34 is shifted to its dotted line position to shut off the suction from the suction heads 22 to release the sheet 8 by venting the heads 22 to atmosphere through the vent 40.

As the rock arm 41 continues to swing forwardly with an accelerated movement, the suction heads 22 and hollow arms 24 are advanced beyond the leading edge of the sheet 8 and are drawn downwardly beneath the plane of the upper run of the feed-tapes 13 through the downward movement of the bracket 51 as the cam-roller 49 is travelling toward the forward end of the cam-slot 50 as shown in Fig. 2. The sheet 8 is now advanced by the feed-tapes 13 into the bite of the second pair of feed-rolls 14 and 19 and so forwarded to the press, while the suction heads 22 are retracted beneath the rear portion of the sheet to their sheet-engaging position over the pile 3 for the next cycle with the feed-rolls 16 lifted out of the way of the retracting suction heads. Such underlapped sheets as they are fed forwardly serve to aid in advancing the superposed sheet so that the successive sheets are carried at an equalized rate of speed through the feeder before reaching the usual side-registering mechanisms and front gages of the press.

While the foregoing sets forth the embodiment of my invention, many changes in the structural details may be made without departing from the principles and scope of the invention or sacrificing the chief advantages obtainable for its use in separating and advancing successive sheets from a pile.

I claim as my invention:—

1. In a sheet-feeder, sheet-forwarding means and suction means for separating and advancing a sheet from a pile to said forwarding means, said suction means being moved forwardly and downwardly beneath the sheet when said sheet is under control of said forwarding means.

2. In a sheet-feeder, sheet-forwarding means, suction means for separating and advancing a sheet from a pile having an orbital path to advance the sheet to said forwarding means, and means to move said suction means forwardly and downwardly beneath the sheet when said sheet is under control of said forwarding means.

3. In a sheet-feeder, sheet-forwarding means, suction means for separating and advancing a sheet from a pile having an orbital path in a substantially vertical plane to advance the sheet to

said forwarding means, and means to intermit the suction and lower said suction means beneath the sheet when the latter is under control of said forwarding means.

4. In a sheet-feeder, sheet-forwarding means and suction means for separating and advancing a sheet from a pile to said forwarding means, said suction means being moved forwardly and downwardly beneath the sheet after releasing said sheet when under control of said forwarding means.

5. In a sheet-feeder, sheet-forwarding means, suction means for separating and advancing a sheet from a pile to said forwarding means, means to move said suction means forwardly and downwardly beneath the sheet when under control of said forwarding means, and means to retract said suction means to the pile while the sheet is being forwarded.

6. In a sheet-feeder, an oscillatable suction means for separating and advancing a sheet from a pile, said means being moved forwardly and downwardly beneath the advancing sheet during the end of its forward stroke.

7. In a sheet-feeder, an oscillatable suction means for separating and advancing a sheet from a pile, said means being moved forwardly and downwardly beneath the advancing sheet during the end of its forward stroke and retracted to the pile while the sheet is being forwarded.

8. In a sheet-feeder, feed-rolls for forwarding a sheet and an oscillatable suction means for separating and advancing a sheet from a pile to said rolls, said means being moved forwardly and downwardly beneath the advancing sheet during the end of its forward stroke.

9. In a sheet-feeder, feed-rolls for forwarding a sheet and an oscillatable suction means for separating and advancing a sheet from a pile to said rolls, said means being moved forwardly and downwardly beneath the advancing sheet during the end of its forward stroke and retracted to the pile while the sheet is being forwarded.

10. In a sheet-feeder, coacting feed-rolls to forward a sheet one of said rolls having a bodily movement away from the other, suction means for separating and feeding a sheet from a pile between said rolls when separated, means to bring said rolls into operative engagement with the sheet, and means to move said suction means forwardly and downwardly beneath the sheet when carried by said rolls.

11. In a sheet-feeder, coacting feed-rolls to forward a sheet one of said rolls having a bodily movement away from the other, suction means for separating and feeding a sheet from a pile between said rolls when separated, means to bring said rolls into operated engagement with the sheet, means to move said suction means forwardly and downwardly beneath the sheet when carried by said rolls, and means for separating said rolls when said suction means are retracted to the pile.

12. In a sheet-feeder, intermittently separable

feed-rolls to forward a sheet when said rolls are in coacting engagement therewith, and an oscillatable suction means for separating and advancing a sheet from a pile to said feed-rolls, said rolls being separated when said suction means is moving through the zone of said rolls.

13. In a sheet-feeder, intermittently separable feed-rolls to forward a sheet when said rolls are in coacting engagement therewith, an oscillatable suction means for separating and feeding a sheet from a pile to said feed-rolls, said rolls being separated when said suction means is moving through the zone of said rolls, and a second pair of feed-rolls for advancing the sheet when the first pair of feed-rolls are separated.

14. In a sheet-feeder, a series of suction heads operating on the front portion of a pile of sheets to separate and advance same, and means for sequentially raising, advancing and then lowering said heads all in a substantially vertical plane beneath the advancing sheet when released from said heads.

15. In a sheet-feeder, a series of suction heads operating on the front portion of a pile of sheets to separate and advance same, sheet-forwarding means to which the sheet is carried by said suction heads, and means for moving said heads forwardly and downwardly beneath the sheet when under control of said sheet-advancing means.

16. In a sheet-feeder, a series of suction heads operating on the front portion of a pile of sheets to separate and advance same, sheet-forwarding means to which the sheet is carried by said suction heads, and means for moving said heads forwardly and downwardly beneath the sheet when under control of said sheet-advancing means and retracting said heads to the pile beneath the advancing sheet.

17. In a sheet-feeder, oscillatable suction means for separating and advancing a sheet from a pile and movable in a vertical plane to convey the leading edge of the advancing sheet beneath the preceding fed-off sheet.

18. In a sheet-feeder, suction means for successively separating and advancing sheets from the top of a pile in underlapped relation, said suction means moving at all times underneath the previously separated sheet.

19. In a sheet-feeder, sheet forwarding means, suction means for successively separating and advancing sheets from the top of a pile to said forwarding means in underlapped relation, said suction means moving at all times underneath the previously advanced sheet.

20. In a sheet-feeder, sheet forwarding means, suction means for successively separating, advancing and releasing sheets from the top of a pile to said forwardly means in underlapped relation, said suction means moving at all times underneath the previously advanced and released sheet.

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