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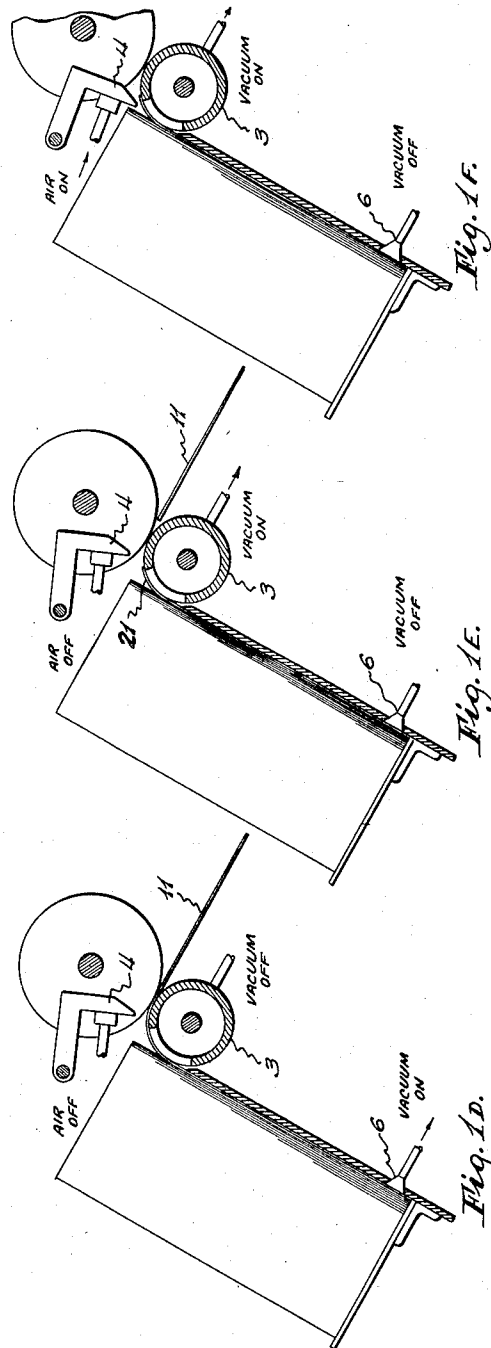
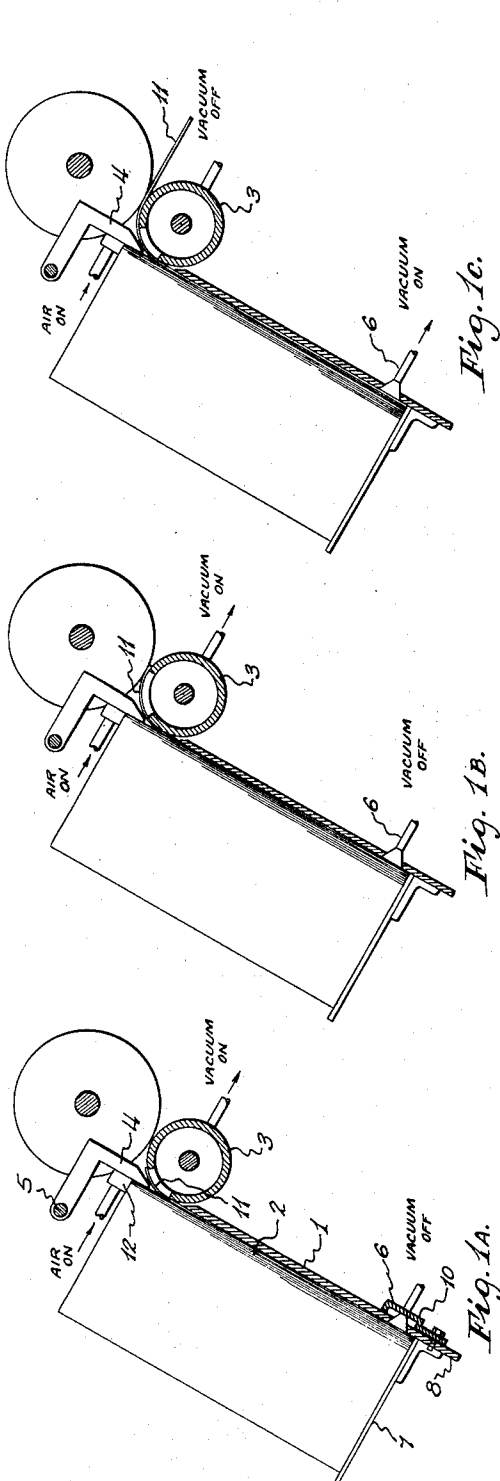
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2,849,232

SHEET FEEDER

Filed Jan. 7, 1955

3 Sheets-Sheet 1



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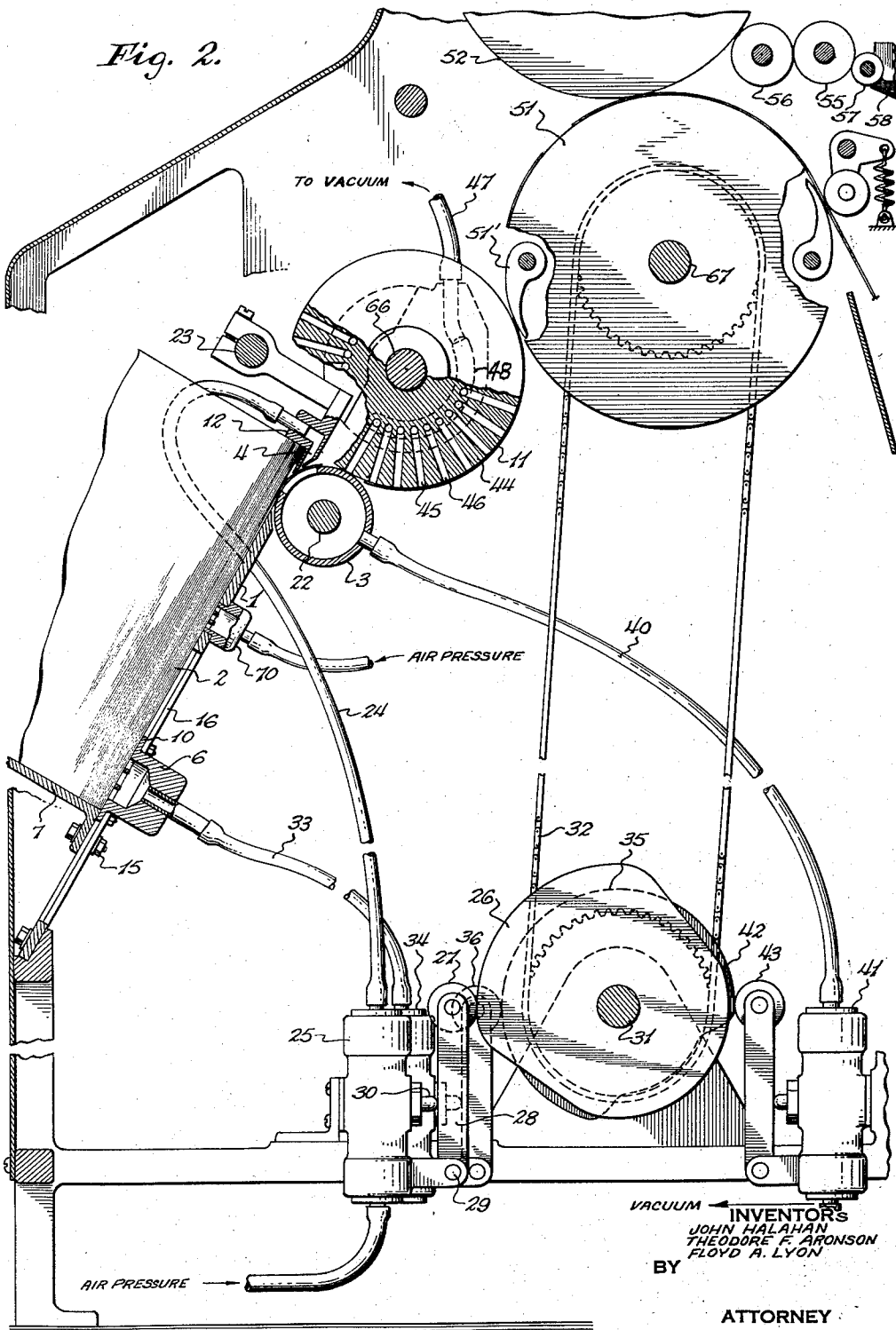
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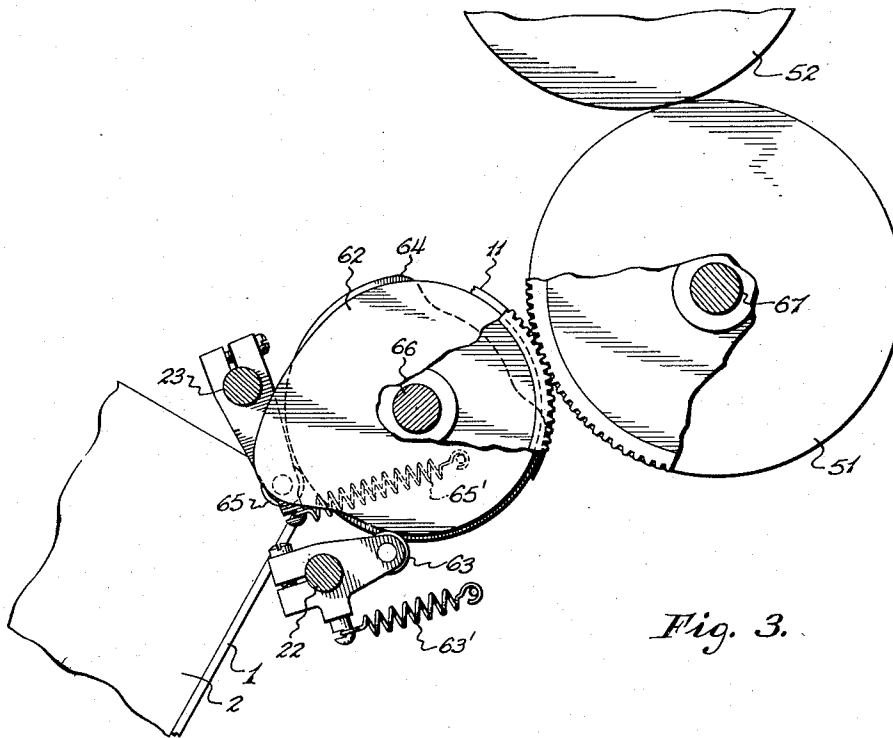


Fig. 3.

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SHEET FEEDER

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4 Claims. (Cl. 271-29)

This invention relates to paper or sheet feeders, and, more particularly, to means for feeding papers one at a time from a stack.

More particularly, the invention relates to such means utilizing a vacuum sucker in combination with an air blast for helping to separate papers and the like from a stack.

The present invention comprises an oscillatory vacuum sucker combined with an air blast nozzle which is rotatably mounted adjacent the top of the stack of papers for the purpose of utilizing an air blast to help separate the bottom paper from the stack. A registration member is connected to the air blast nozzle, the purpose of which is to rest on the stack to keep it in proper registration. The invention also includes a stationary vacuum sucker connected to the lower underside of the inclined rack for the purpose of holding the lower portion of the paper stack for purposes of registration. The vacuum suckers and the air blast are operated and valved in sequence by a cam drive. The vacuum sucker may be rotatable or stationary with other means to move the papers.

Accordingly, a principal object of the invention is to provide new and improved high speed paper feeding means.

Another object of the invention is to provide high speed paper feeding means comprising a vacuum sucker in combination with air blast means.

Another object of the invention is to provide new and improved paper feeding means comprising an oscillatory vacuum sucker, a rotatably mounted air blast means and a stationary vacuum sucker.

Another object of the invention is to provide new and improved paper feeding means comprising a vacuum sucker, means to insure registration of the papers comprising means to rest on top or leading edge of the stack while one paper is beginning to be separated and means to hold the bottom of the stack while the bottom paper is being further separated.

Another object of the invention is to provide means for feeding paper separately from a stack comprising a rack to hold said stack, an oscillating cylindrical vacuum sucker located adjacent to the top side of said rack, an air blast nozzle oscillatably mounted adjacent the top of said rack, means connected to oscillating vacuum sucker and said nozzle in predetermined sequence, and a stationary vacuum sucker connected to the lower side of said rack.

Another object of the invention is to provide means for feeding paper separately from a stack comprising a rack to hold said stack, an oscillating cylindrical vacuum sucker located adjacent to the top side of said rack, an air blast nozzle oscillatably mounted adjacent the top of said rack, means connected to oscillating vacuum sucker and said nozzle in predetermined sequence, and a stationary vacuum sucker connected to the lower side of said rack and means to valve said vacuum suckers and said air blast in predetermined sequence.

These and other objects of the invention will be ap-

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parent from the following specification and drawings of which:

Figures 1-A—1-F are a series of schematic diagrams illustrative of the operation of the invention.

Figure 2 is an elevation sectional view of an embodiment of the invention, and

Figure 3 is a partial elevation sectional view of an embodiment of the invention.

Referring now to Figures 1-A—1-F illustrating the sequence of operations of the invention, the invention comprises an inclined rack 1 which contains a stack of papers 2 and a slotted oscillatory cylindrical vacuum sucker 3 located adjacent the top underside of said rack 1. An air blast nozzle 4 is rotatably mounted about the axis 5, and a vacuum sucker 6 is mounted on the underside of the rack 1 near the bottom. The bottom part of the rack 7 is adjustably connected to the underside member 8 so that various size papers may be accommodated. The lower vacuum sucker 6 is adjustably connected to the bottom member 7 or the side member 1 of the rack by means of the bracket 10.

Note in the following discussion the overlapping relation of the papers over the slots of oscillatory sucker 3. The overlapping papers seal the slots at all times, which permits much greater speed of operation.

Figure 1-A shows the bottom paper 11 being peeled off and separated by the vacuum in the oscillatory sucker 3. The air blast from nozzle 4 is being used to help separate the bottom paper and float weight stack off bottom sheet, and the block member 12 connected to the air blast nozzle 4 is resting on top of the stack 2 to keep the remaining papers in perfect registration. The air blast also blows back any second sheet that might be separated with the first. Vacuum on sucker 6 is off.

Figure 1-B shows the bottom paper 11 pulled around by the oscillation of the vacuum sucker 3. Vacuum on sucker 6 is off and can now be turned on since sheet 11 is now off it.

Figure 1-C shows the paper 11 being removed by means, not shown, and the vacuum sucker 3 returning to its first position. The vacuum in sucker 3 has preferably been turned off although it may be reduced or even left on, and the vacuum on the stationary sucker 6 has been turned on to prevent the next paper from being pulled as the bottom paper is being removed. The air blast in nozzle 4 remains on.

Figure 1-D shows the paper 11 further removed, the vacuum sucker 3 in its first position and the air blast nozzle 4 is lifted up to allow next sheet to suck down with the air blast turned off, the bottom vacuum sucker 6 remains on.

Note that as the trailing edge leaves the sucker the next paper is attracted in overlapping relation, the papers sealing the vacuum at all times.

Figure 1-E shows the first paper 11 completely removed and the next paper 21 peeled off in the same position as shown in Figure 1-A. The stationary sucker 6 vacuum remains on, and the air blast remains off.

Figure 1-F shows the air blast nozzle 4 returning to the position of Figure 1-A, whereupon the sequence will be repeated with blast on, and this will blow back any second sheet that may have been stuck to bottom sheet. This is an important point.

A second air blast 70 Fig. 2, may be added to put an air film between the stack and the rack so that the bottom sheet is air floated on each side to help overcome any suction or static electric attraction.

Referring now to Fig. 2, the apparatus is shown in more detail. The stack of papers 2 is mounted in the rack 1. The bottom member 7 is adjustably connected to the rack 1 by means of the nut and bolt 15. The vacuum sucker 6 is adapted to be adjustably connected to the

rack 1 to exert its vacuum on the stack through the slot 16 in rack 1. The oscillatory sucker 3 is oscillatably mounted on the axis of shaft 22 and the air blast nozzle 4 is oscillatably mounted on the shaft 23.

The air blast nozzle 4 is connected by means of the flexible hose 24 to the valve 25 and thence to a source of air pressure. The valve 25 is connected to be actuated by the cam 26 by means of the cam follower which is mounted on the arm 28. The arm 28 is rotatably mounted at the point 29 so that as the cam 26 rotates, the arm 28 will actuate the plunger 30 to operate the valve. The cam 26 is mounted on the main cam shaft 31, which is driven by means of the chain 32.

The stationary vacuum sucker 6 is connected by means of the flexible hose 33 to a second valve 34 which is adapted to be actuated by the cam 35 by means of the cam follower 36 in the same manner as described in connection with the valve 25. Cam 35 is also mounted on the cam shaft 31 in a predetermined position to provide the proper timing sequence.

The oscillatory vacuum sucker 3 is connected by means of the flexible hose 40 to a third valve 41 which is adapted to be actuated by a third cam 42 by means of the cam follower 43. The vacuum valves 41 and 34 are connected to a source of vacuum. All the cams are adjustably mounted on the cam shaft 31 in the proper manner to provide the desired timing sequence of the two vacuum suckers and the air blast as described in connection with Figures 1-A through 1-F. The cam shaft is driven by the chain 32, which is also connected to the take away rollers as will be more fully explained in connection with Figure 3.

The block member 12, connected to the rotatable air blast nozzle, is shown resting on top of the stack 2 of papers to keep them in registration while the bottom paper is being removed. As soon as the bottom edge of the paper being removed clears the vacuum sucker 6, the vacuum there is turned on to clamp the next bottom paper at its lower edge so that it will not be pulled by the paper being removed and at this point it is no longer necessary to keep member 12 resting on stack 2.

The transfer means for removing the paper from the vacuum sucker 3 in the embodiment shown in Figure 2 is the roller 44 which contains a plurality of holes or apertures 45 and 46, etc., which are also connected to a source of vacuum by means of the pipe 47. The roller 44 continuously rotates in one direction and has the holes on a sufficient portion of its outside surface. The vacuum holes are valved by the valve 48 so that the holes on the bottom side of the roller will have vacuum pressure so as to pick up the paper 11 from the vacuum sucker 3 and feed it to take away or printing roller 51 in perfect registration. The roller 51 may be of the clamp type, the clamp 51' being in a different plane than the contact between the rollers. That is the two vacuum means are spaced along their axis, the clamp of roller 51 being positioned between them. There is preferably spring loading between roller 44 and the vacuum sucker to take away the papers mechanically, thence the vacuum holes transfer them to clamp cylinder.

Another air blast means 70 may be added to float the bottom paper off the rack.

The paper is fed to the printing roller 52 and then ejected. The inking rollers 55, 56 and 57 are connected and adapted to ink the printing roller 52 from the ink well 58.

The take away roller 44 is only one of many types of take away mechanisms that could be used with the invention. Various other conventional take away means will occur to those desiring to practice the invention.

Figure 3 shows details of the construction shown in Figure 2 and specifically shows the driving mechanism for driving the oscillatory vacuum sucker 3, the air blast 4 mechanism and the take away roller mechanisms. The oscillatory sucker 3 is actuated by the shaft 22 which is

oscillated by means of the cam 62 and cam follower 63. The air blast nozzle 4 is rotatably mounted on the shaft 23 which is adapted to be oscillated by the cam 64 by means of the cam follower 65. The cam followers 63 and 65 are spring loaded by the springs 63' and 65'. The cams 62 and 64 are mounted on a cam shaft 66 which is geared to the driven shaft 67. The take away pick up roller 44, Figure 2, having the evacuated holes is also mounted on the shaft 66 and is adapted to be driven by the driven shaft 67 through suitable gearing.

The surface speed of the take away pick up roller 44 should preferably be the same as the surface speed of the oscillatory vacuum sucker 3 at the time of pick up of sheet by roller 44 in order to smoothly remove the paper. Various other take away means could be used instead of the roller 44 and the drive gearing and the cams are preferably designed to achieve the optimum condition, namely, that the surface speed of the take away means and the oscillatory roller should be the same in order to provide smooth operation and perfect registration of the papers.

The oscillatory sucker 3 is shown as a cylinder and this shape has been found preferable in certain embodiments. However, the cross section could be oval or elliptical or some other variation of shape as long as it is inclined away from the stack at the leading edge of the paper, to provide separation. The length of the vacuum cylinder 3 along the axis 22 should be sufficient to apply enough vacuum pressure according to the size and weight of the paper. Alternately, several small evacuated cylinders could be mounted on the same shaft to handle larger pieces of paper. The dimensions of all the members are dependent upon the size of the material that it is desired to handle and other specifications of the material such as the stiffness and thickness of the papers. Naturally, if the paper is thicker and stiffer, more vacuum pressure will be needed.

The angle of the rack 1 with respect to handling is preferably adjustable so that the weight component of the papers may be adjusted for maximum operating conditions depending upon the size of the papers and the weight of the stack. As the angle of the rack 1 approaches the vertical position, there is less weight on the bottom paper which is being removed. The rack can be horizontal.

Therefore, the present invention shows an improved paper feeding means utilizing an air blast in combination with a vacuum type feed. Papers are stacked on an inclined rack and the bottom paper separated by means of an oscillating vacuum sucker in combination with an air blast. Registration is maintained by a registration method which rests on top of the stack while the paper is being removed and also by another vacuum sucker which clamps the next bottom paper of the stack while the bottom paper is being removed. Means are provided for valving and actuating the vacuum suckers and the air blast. These means are shown as a cam drive although other equivalent means could be used. Attention is called to the fact that the papers are removed from the bottom of the stack in overlapping relation so that they completely seal the slots of the oscillating sucker at all times. This arrangement permits the optimum speed of operation. The speed of operation may be adjusted by adjusting speed of the drive motor and should be determined for optimum conditions depending upon the size and weight of the papers to be handled.

We claim:

1. Means for feeding paper separately from a stack comprising an inclined rack to hold said stack, an oscillating vacuum sucker located adjacent the upper side of said rack, air blast nozzle oscillatably mounted adjacent the top of said rack, a registration member connected to said air blast nozzle and adapted to rest on top of said stack, means to oscillate said oscillating sucker and said nozzle in predetermined sequence and stationary vacuum

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sucker means connected adjacent the lower side of said rack.

2. Means for feeding paper separately from a stack comprising an inclined rack to hold said stack, an oscillating vacuum sucker located adjacent the upper side of said rack, air blast nozzle oscillatably mounted adjacent the top of said rack, a registration member connected to said air blast nozzle and adapted to rest on top of said stack, means to oscillate said oscillating sucker and said nozzle in predetermined sequence and stationary vacuum sucker means connected adjacent the lower side of said rack and means to valve said vacuum suckers and said air blast in a predetermined sequence comprising cam operated valves connected to said vacuum suckers and said air blast nozzle and means connected to drive said cam operated valves.

3. In a paper feeding mechanism, means for separating paper from a stack comprising, hollow oscillating member means having an apertured surface portion, means to apply a partial vacuum continuous between papers to said hollow oscillating member, said last means being adapted to separate the leading portion of the closest paper of said stack, and oscillating air blast means adjacent said oscillating sucker means connected to limit said separation to one sheet.

4. In a paper feeding mechanism, means for separating papers from a stack comprising, hollow oscillating member means having an apertured surface portion, means to

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apply a partial vacuum continuous between papers to said hollow oscillating member, said last means being adapted to separate the leading portion of the closest paper of said stack, means to take said separated paper away, said surface portion being apertured and means to oscillate said oscillating member so that as the trailing edge of a preceding paper goes across said surface the next paper is sucked onto said surface in overlapping relation to said preceding paper, said vacuum being continuous between papers, and air blast means connected to assist said separation.

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