

April 11, 1961

J. M. CUNNINGHAM
PAPER FEEDING MECHANISM

2,979,329

Filed Dec. 24, 1956

3 Sheets-Sheet 1

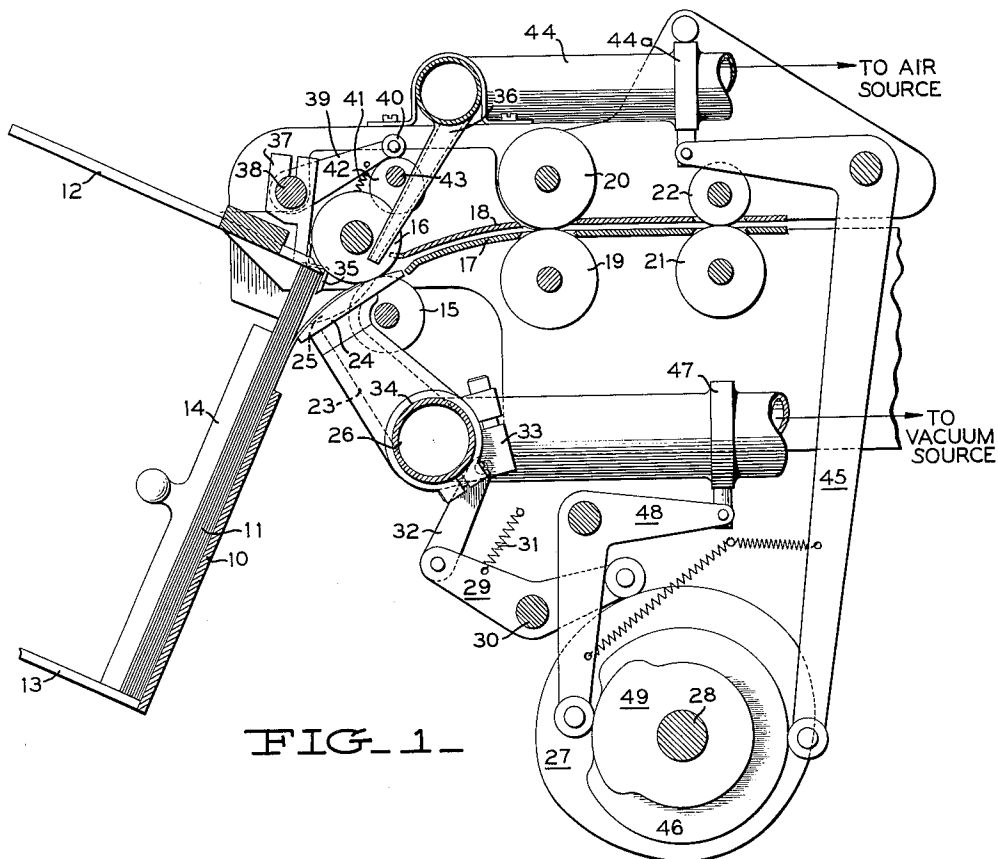


FIG. 1-

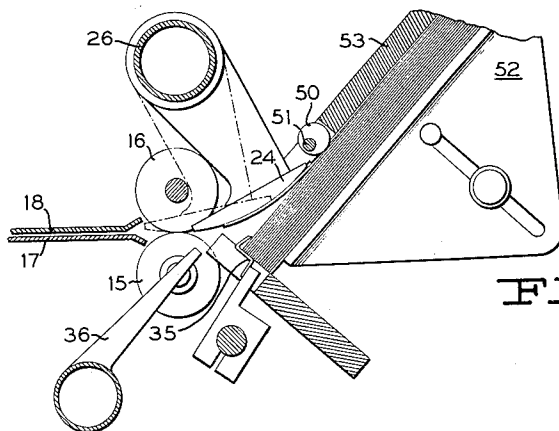


FIG. 2-

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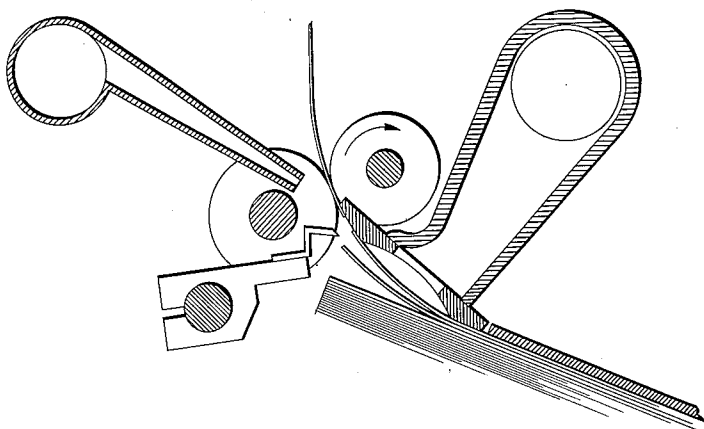


FIG. 3c-

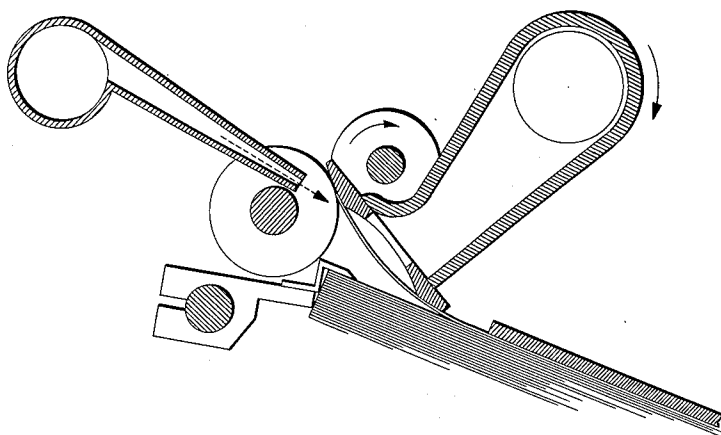


FIG. 3b-

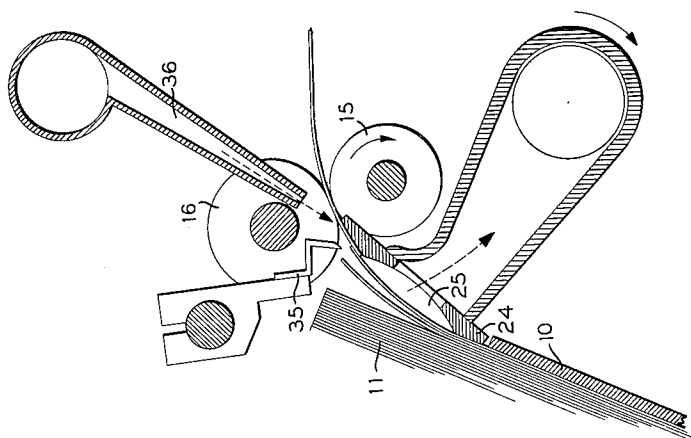


FIG. 3a-

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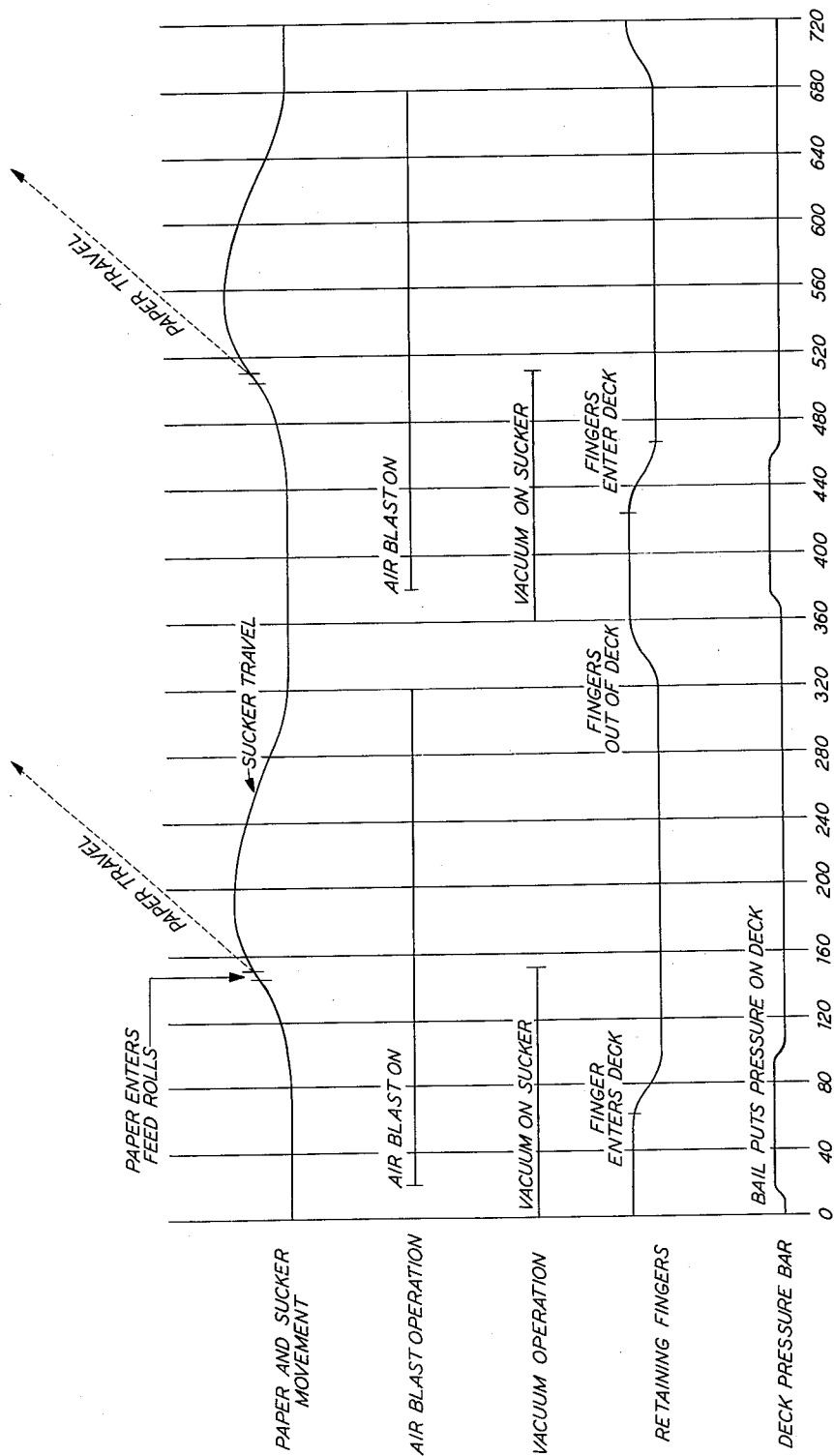


FIG. 4-

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PAPER FEEDING MECHANISM

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2 Claims. (Cl. 271-29)

This invention relates to a machine which will remove papers from a stack of papers, one paper at a time, and is adapted to feed sheets of paper in succession to other apparatus such as printing devices and the like.

One of the principal objects of this invention is to provide an improved vacuum feeding mechanism which comprises an oscillating vacuum chamber having cam controlled motion, the vacuum chamber functioning to separate a portion of the outermost sheet from a stack of papers and to feed said partially separated sheet to other devices for removal in its entirety from the stack.

Another object of the present invention resides in providing, in a paper feeding mechanism of the foregoing character, a separating mechanism comprising a deck retaining finger and an air blast nozzle which directs a blast of air at the leading edge of the sheet of paper to be fed.

More particularly, it is an object of this invention to provide a paper feeding mechanism of the foregoing character wherein means are provided for putting pressure on the stack of papers beyond the leading edge to cause a restriction to the passage of air from the air blast nozzle between the partially separated outermost sheet and the remainder of the stack. As a result pressure is built up between the sheet attracted to the vacuum chamber and the remainder of the stack which insures a fast positive separation of only the outermost sheet and eliminates the possibility of double feeding of sheets.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is an elevation view showing one embodiment of the present invention wherein sheets are fed from the bottom of the stack.

Fig. 2 is a fragmentary elevation view showing a second embodiment of the present invention wherein the sheets are fed from the top of the stack.

Figs. 3a-3c are diagrammatic views illustrating the operation of the present invention.

Fig. 4 is a timing chart.

Referring to Fig. 1, the machine comprises a hopper bottom plate 10 for supporting a stack of sheets 11 in an inclined fashion, a front plate 12 and back plate 13, and a suitable weight member 14 for exerting pressure on top of the stack. From the hopper the sheets are to be directed to a pair of continuously running feed rolls 15, 16 which serve to feed the separated sheets in between a pair of guide members 17, 18. Additional pairs of continuously running feed rolls 19, 20 and 21, 22 are provided to feed the sheets to other apparatus in the machine.

The sheet feeding mechanism is composed of a vacuum feeding mechanism and an air blast separating mechanism. The vacuum feeding mechanism consists of at least one

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oscillating vacuum chamber 23 having cam controlled motion. The end 24 of the chamber is formed to provide a sucker finished with a radius about its geometric center and a port 25 is provided in the sucker to allow vacuum to be exposed to the deck of paper in the hopper. The port communicates between the exterior of the chamber and the interior thereof to which is supplied vacuum from a suitable vacuum source by means of a pipe connection 26. The sucker assembly and vacuum pipe are oscillated by means of a continuously running cam 27 on a shaft 28 suitably journaled in side frames of the machine. A cam follower lever 29 pivoted on a stud 30 follows the cam under the influence of a spring 31 and pivoted to the free end of said lever is a link 32 which in turn is pivoted to a support block 33 suitably mounted for rotation on a short shaft (not shown) anchored to the side frame of the machine. The sucker chamber 23 is fixed to said support block for movement therewith and accordingly the cam and linkage operate to oscillate the sucker assembly back and forth between the leading edge of the hopper bottom plate 10 and the entrance to the sheet guides 17 and 18 for each sheet to be fed. The sucker chamber 23 is clamped tight to the vacuum pipe 26 which has a port opening at 34 for communication with the chamber and hence the pipe will rotate with the sucker assembly. It can be understood that several sucker assemblies may be clamped along the vacuum pipe 26, which extends across the machine, to take care of wide sheets.

The separating mechanism comprises at least one deck retaining finger 35 for supporting the remainder of the deck away from the sheet being separated and at least one stationary air nozzle 36 which directs a blast of air at the leading edge of the sheet to be fed.

The deck retaining finger 35 is fixed to a block 37 which is fastened on a rod 38 extending across the machine and suitably journaled in the side plates. Fastened on the rod is an arm 39 having a roller follower 40 and, under the influence of a spring 41, the roller follower is urged to follow the periphery of a continuously running cam 42 mounted on a stud 43 journaled in the side frame of the machine. The cam and arm operate to pivot the retaining finger 35 into and out of engagement with the deck and, if desired, a plurality of retaining finger assemblies may be fastened across the rod depending on the width of the sheets being fed.

The air nozzle 36 is fastened to and communicates with the interior of a pipe 44 which is connected to a suitable source of air pressure. A suitable valve 44a placed in the air line is operated through a bell crank 45 and cam 46 and, as shown in Fig. 4, the valve operates to admit air to the nozzle 36 during a portion of the first half of each sheet feed cycle. In like fashion, a valve 47 placed in the vacuum line is operated through a bell crank 48 and cam 49 to provide vacuum to the sucker member during approximately the first 150 degrees of each feed cycle.

In describing the sequence of operation of the sheet feeder, it is convenient to start at the point in the cycle where the trailing edge of a sheet of paper which has been fed is just leaving the sucker surface as shown in Fig. 3a. At this time, which is shown as the start of a cycle, either 0 or 360 degrees on the timing chart (Fig. 4), the deck retaining finger 35 is withdrawn from the deck and the vacuum is turned on. The vacuum is applied to the bottom of the deck by allowing the sheet being fed out by the feed rolls 15, 16 to act as a valve as it uncovers the port 25 in the sucker member. With the finger withdrawn and vacuum on the sucker surface, a sheet or several sheets are attracted to the sucker feed surface. After allowing sufficient time for the sheets to be attracted to the sucker surface, the air blast is in-

roduced by operating the valve 44a in the air line. The blast of air directed by the nozzle 36 at the leading edge of the sheet to be fed is not strong enough to remove the first sheet of paper from the sucker but it will force any additional sheets of paper which may have been attracted to the sucker back against the deck as shown in Fig. 3b. In keeping with the spirit of the invention, the hopper bottom plate 10 is instrumental in this separating operation in that it puts pressure on the deck beyond the leading edge and thus forms a restriction causing the pressure to build between the first sheet which is attracted to the sucker and the remaining sheets at a point a short distance behind the leading edge. This pressure starts at the point of contact between the deck and hopper plate and progresses very rapidly toward the leading edge of the sheets resulting in a fast and positive separating action. The hopper plate provides an effective restriction but does not completely cut off the flow of air through the deck.

After the air blast has separated any additional sheets from the one to be fed, the retaining finger 35 is introduced into the deck between the sheet to be fed and the remainder of the deck to prevent the fed sheet from dragging any additional sheets along with it. With the retaining finger holding the deck, the sucker is oscillated so that the leading edge of the sheet of paper to be fed is introduced into the feed rolls 15, 16. It should be noted that the air blast remains on during this operation and continues to stay on until just before the fed sheet is completely removed from the deck. The reason for this is that the flow of air between the fed sheet and the remainder of the deck reduces the deck friction and thus allows easier feeding.

After the sheet of paper is introduced into the feed rolls, the vacuum is cut off to allow easy sliding of the sheet across the sucker surface. As shown in Fig. 3c, the sucker member is oscillated back to its home position and starts the separating operation of the next sheet as the preceding sheet is fed on to its destination by the feed rolls.

In Fig. 2 there is shown a second embodiment of the invention for feeding sheets off the top of the deck rather than the bottom. In this embodiment the feeding mechanism is inverted and an eccentric deck pressure bar 59 mounted on a continuously running shaft 51 is provided to perform the function of restricting the flow of air through the deck and allow pressure to be built up between the sheet to be separated and the remainder of the deck. As shown in Fig. 4, at the proper time in the beginning of each cycle the pressure bar is forced against the deck behind the leading edge of the sheets. A suitable spring tensioned deck support plate 52 is provided to maintain the deck of paper up against the pressure bar 50 and hopper frame 53. It may be noted that in the arrangement shown in Fig. 2, it is not necessary to keep the air blast on after the fingers 35 have been operated against the deck as pressure will be removed from the deck by action of the eccentric 50.

In practice it has been found that the present mechanism

utilizing the air blast separation principle with restriction means for causing pressure to build up between the sheet to be separated and the remainder of the deck provides a positive and extremely reliable feeding device for feeding almost any kind of paper which is reasonably non-porous and not extremely mutilated and sheets of varying size and ranging in stiffness from tissue paper to card stock have been fed in large quantities with no occurrence of misfeed or double feed.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A feeding mechanism for paper and the like comprising a hollow sucker member having an arcuate surface provided with an opening communicating between the exterior and interior of said member, a hopper bottom plate for supporting a stack of papers in part with the unsupported end of said papers projecting above said arcuate surface, a weight member positioned on top of said stack, means for supplying vacuum to the interior of said member to cause the end paper to overlap said arcuate surface, means for directing a blast of air between the partially separated end paper and the remainder of the stack, said plate and stack cooperating to effect a build-up of air pressure between the separated portion of said end paper and the remainder of the stack, and means for feeding said end paper from the stack.
2. A feeding mechanism for paper and the like comprising a hollow sucker member having an arcuate surface provided with an opening communicating between the exterior and interior of said member, means for supporting a stack of papers adjacent said arcuate surface, means for supplying vacuum to the interior of said member to cause the leading edge of the end paper to overlap said arcuate surface, means for directing a blast of air between the partially separated end paper and the remainder of the stack, a rotatable eccentric bar operable during said air blast for pressing said end paper against the stack at a contact point rearwardly from the separated portion of said end paper to restrict the flow of air between said end paper and the remainder of the stack, and means for feeding said end paper from the stack.

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