March 15, 1955 J. HALAHAN ET AL 2,704,209

PAPER FEEDING MECHANISM

Filed Jan. 29, 1951 3 Sheets-Sheet 1

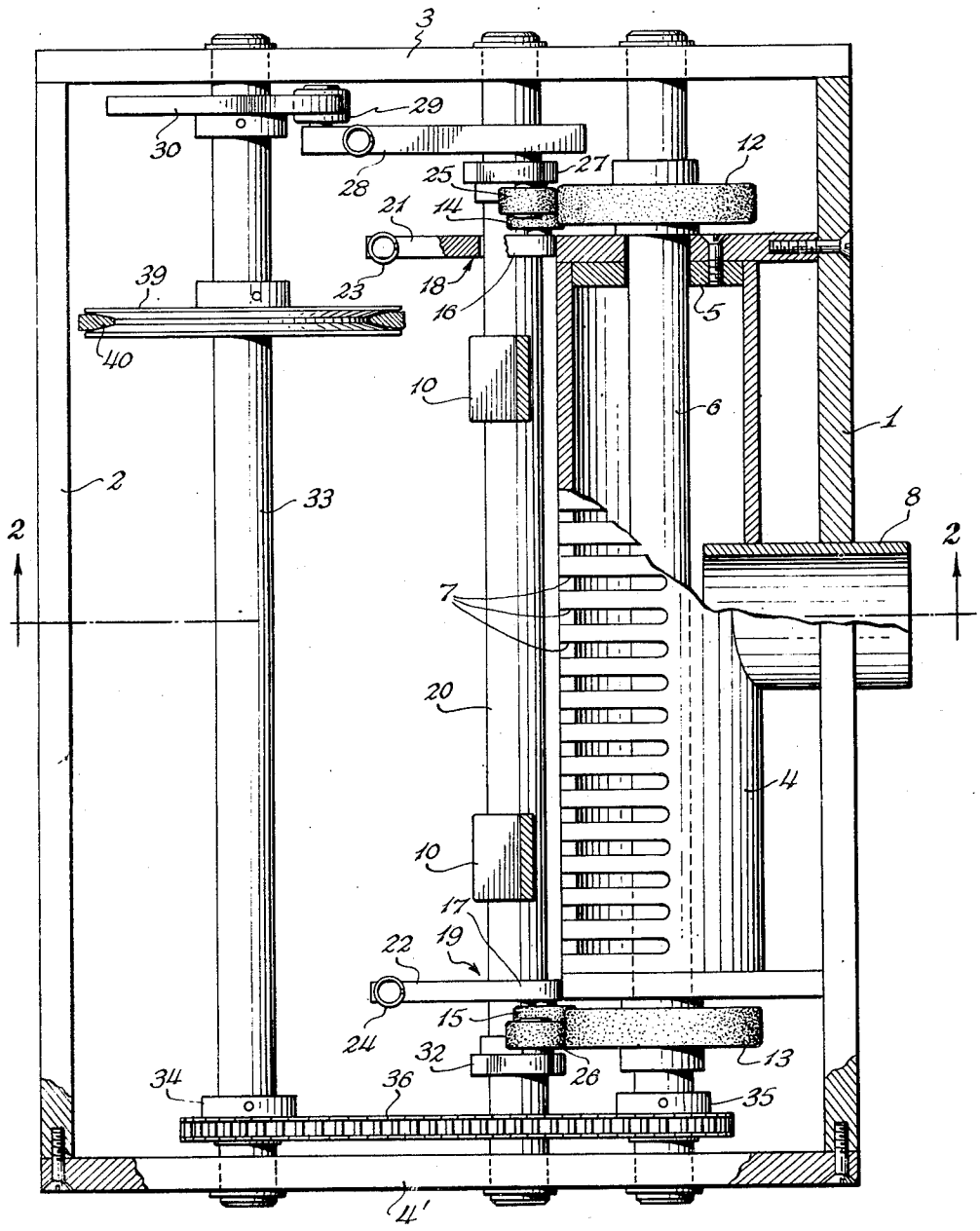


Fig. 1.

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Filed Jan. 29, 1951 3 Sheets-Sheet 2

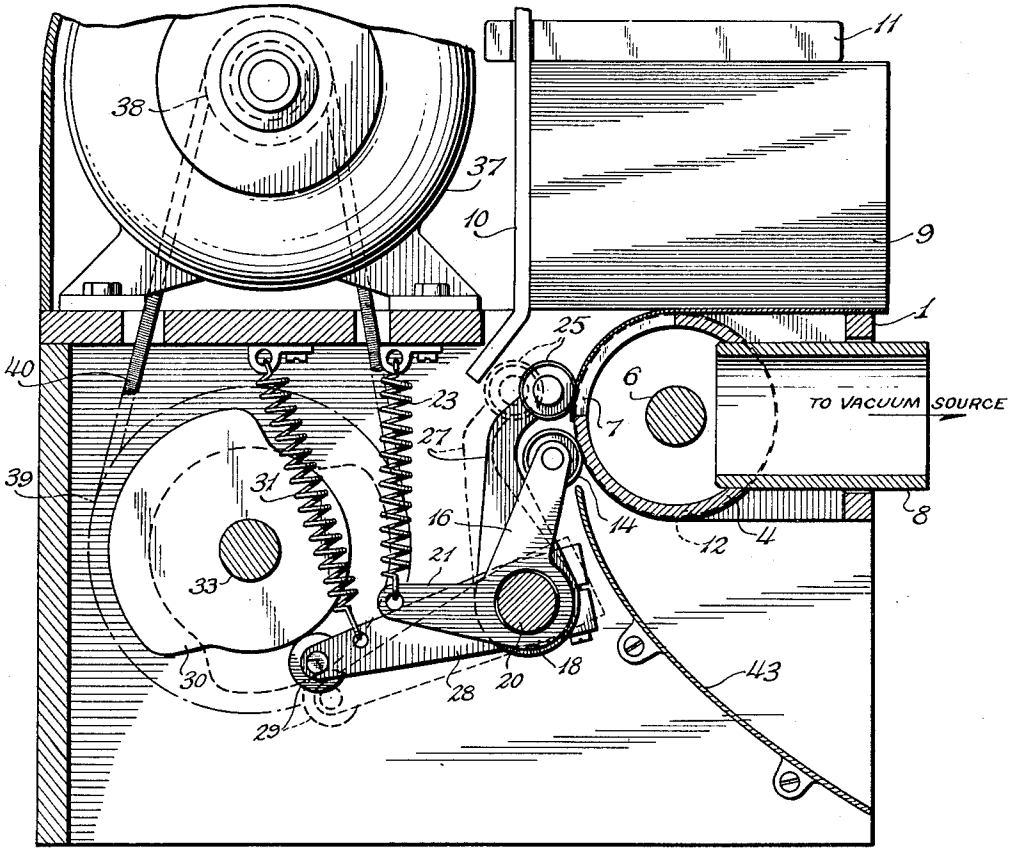


Fig. 2.

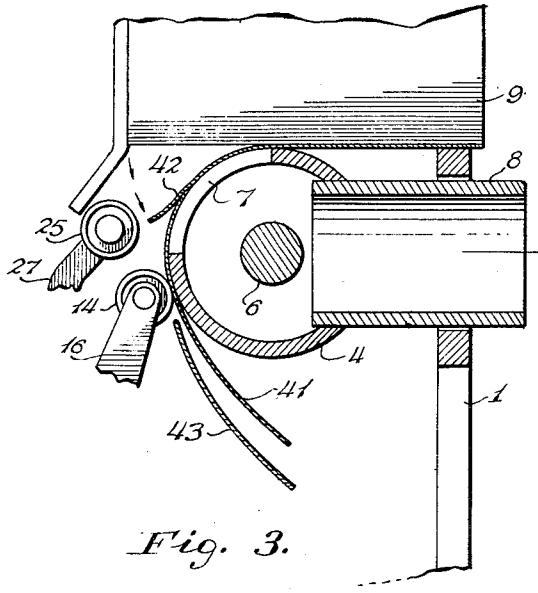


Fig. 3.

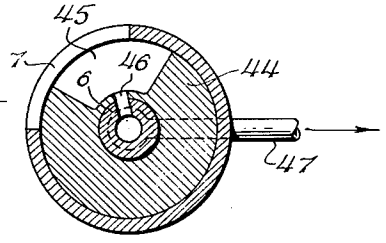


Fig. 4.

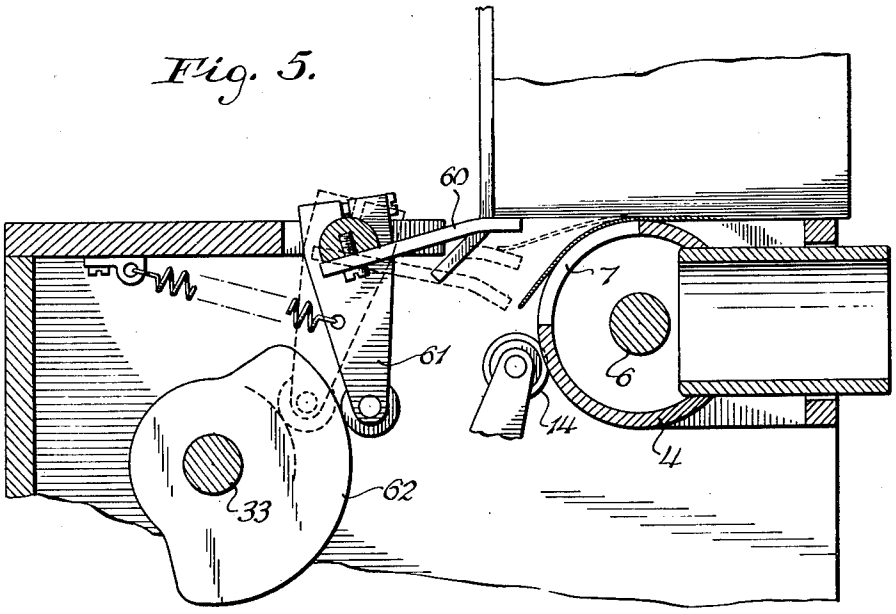
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Fig. 5.



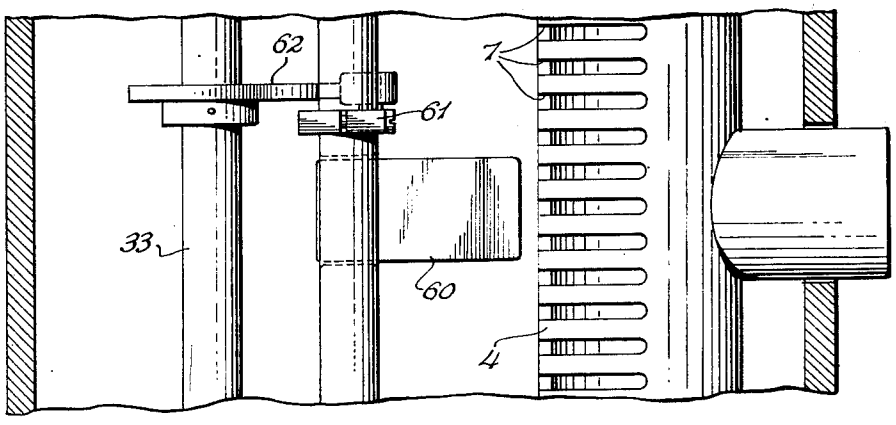


Fig. 6.

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PAPER FEEDING MECHANISM

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Application January 29, 1951, Serial No. 208,398

11 Claims. (Cl. 271—32)

The present 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 machines and the like, or, to have a counter mechanism associated therewith so that the papers may be removed one at a time and counted.

One of the principal objects of this invention is to provide a paper feeding mechanism which comprises a stationary vacuum type take-off, the take-off functioning progressively to separate a portion of the bottom or outermost sheet from a stack of papers, the sheet so partially separated being thereafter removed in its entirety from the stack.

Another principal object of the present invention resides in providing, in a paper feeding mechanism, a vacuum type take-off of the foregoing character which by virtue of the inherent nature thereof eliminates any need for providing suction members having complicated movements and, as a matter of fact, eliminates suction members having any movement whatsoever.

A further object resides in providing a novel paper feeding mechanism in which the bottom or outermost sheet of a stack is removed from the stack and readily fed to feed rollers and the like or by gravity to a chute.

It is a further object to provide a paper feeding mechanism in which the papers are removed one by one from the bottom of a stack.

More particularly, it is an object of this invention to provide a paper feeding mechanism comprising a hollow member upon which a stack of papers may rest with the papers extending substantially horizontally, said hollow member comprising a perforated surface which is inclined with respect to the base of the stack, vacuum being supplied to the interior of the hollow member whereby it functions partially to separate the bottom sheet from the stack. Additionally, a further object resides in providing a mechanism of this character comprising means for temporarily engaging the sheet so separated and for causing it to engage between take-off rollers which serve completely to remove the bottom sheet from the stack. It is still a further object to provide a paper feed mechanism of the foregoing character in which the hollow member is substantially cylindrical and one of the cooperable take-off rollers is mounted coaxially of said cylindrical member and means is provided for passing the partially separated sheet into engagement between the take-off rollers.

With the foregoing and still further objects in view, our invention includes the novel elements and the combinations and arrangements thereof described below and illustrated in the accompanying drawings, in which—

Fig. 1 is a plan view of a preferred form of our invention, partially broken away and in section to illustrate details;

Fig. 2 is a sectional, side elevation view taken in about the plane 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view illustrating the manner of operation of the machine;

Fig. 4 illustrates a modification; and

Figs. 5 and 6 illustrate an additional modification.

It will be understood that the present invention is useful in separating any form of sheet material from a stack and is not necessarily limited to paper. Furthermore, it will function extremely well with paper and the like of extreme thinness such as very fine tissue paper, removing the sheets one by one from a stack thereof. Moreover, although we

have in the following described our invention in connection with a vertically arranged stack of papers, it will be understood that the stack may, if desired, be disposed to extend in other directions such as laterally of the stationary vacuum type take-off member. However, our invention is characterized by its ability to remove papers from the bottom of a vertical stack and hence we have described it in connection with a vertical stack of papers.

Referring first to Fig. 1, it will be seen that our machine comprises a frame having front and rear members 1 and 2 respectively and side members 3 and 4'. In the embodiment illustrated the stationary vacuum type take-off is shown as cylindrical in form and comprises the hollow cylinder 4, each end of which is closed by an end plate 5 which fits closely about shaft 6 extending coaxially of the cylinder 4 and longitudinally of the machine. The cylinder 4 is in part perforated, being provided with a plurality of slotted openings 7 which extend from the top of the cylinder peripherally thereof for approximately 90°. These slots communicate between the exterior of the cylinder and the interior thereof to which is supplied a vacuum by means of the pipe connection 8. In operation, a stack of papers such as that shown at 9 in Fig. 2 is placed upon the machine to rest upon the top of the frame member 1 and upon the top of the cylinder 4 whereby the lowermost paper will overlie one end of the slots 7. As illustrated in Fig. 2 an abutment for the stack 9 of papers may be formed by means of a pair of uprights or bars 10 which are mounted in any suitable manner on the frame of the machine and may serve as a guide for a weight 11 thereby preserving the papers in orderly stacked relation.

As herein indicated, the shaft 6 is mounted coaxially with respect to cylinder 4 and extends longitudinally therethrough being rotatably supported in bearings in opposite end members 3 and 4 of the frame of the machine. A pair of rollers 12 and 13 are secured to shaft 6 to rotate therewith and are positioned at opposite ends of the cylinder 4. Each of these rollers comprise one of a pair of take-off rollers which are formed, at least on the surface thereof, with a material such as rubber affording sufficient frictional engagement with a sheet of paper that it can be withdrawn thereby from the stack. Preferably, the rollers 12 and 13 are of a diameter slightly less than the outside diameter of the cylinder 4 so that the base of the stack will not be engaged thereby. The second roller of both pairs of take-off rollers are indicated at 14 and 15, respectively. These rollers are rotatably supported on arms 16 and 17, respectively, of bell cranks 18 and 19. The bell cranks are loosely supported upon a shaft 20 which extends longitudinally of the machine and is journalled in the end members 3 and 4' of the frame of the machine. The arms 21 and 22 of the bell cranks 18 and 19, respectively, are biased by means of springs 23 and 24 connected between these arms and the frame of the machine, to urge the rollers 14 and 15 into engagement with their cooperating rollers 12 and 13.

In order to pass a sheet of paper, when lying in overlapping relation to the cylindrical member 4, into engagement between the take-off rollers 12, 14 and 13, 15, we preferably provide a pair of rollers 25 and 26 which are adapted to be moved into and out of engagement with the rollers 12 and 13, respectively. The roller 25 is rotatably mounted on the end of arm 27 which is secured to shaft 20 to rotate therewith, and an arm 28 which is also secured to shaft 20 is adapted to effect rotation thereof. Arm 28 has a roller 29 rotatably supported at one end thereof which is adapted to engage a timing cam 30 and act as a cam follower by virtue of the spring 31 which connects the arm 28 to the frame of the machine and biases the roller 29 into engagement with the surface of cam 30. The roller 26 is likewise rotatably mounted on the end of an arm 32 which is secured to shaft 20 for rotation therewith. In operation, the timing cam 30 causes the rollers 25 and 26 to move away from the rollers 12 and 13 and thereafter during a predetermined portion of a cycle of operation of the machine to urge these rollers toward rollers 12 and 13 to firmly engage a sheet of paper therebetween.

For accurate timing, the shaft 33 on and by which the

cam 30 is driven is connected with shaft 6 by means of the sprockets 34 and 35 and chain 36. In this way, the operation of the rollers 25 and 26 is accurately timed with respect to the rotation of the take-off rollers 12 and 13.

The shaft 33 is driven from some suitable prime mover such as the motor 37 shown in Fig. 2 by means of pulleys 38, 39 and belt 40.

In operation, as shown in Fig. 2, the stack of papers will rest as illustrated upon the top of the cylinder 4. Vacuum supplied to the interior of the cylinder will cause a portion of lowermost sheet of paper to separate from the bottom of the stack, starting from a point adjacent the upper end of the slots, and being pulled downwardly in progressively overlapping relation to the cylinder, in the manner shown in Fig. 3, as the preceding sheet of paper is withdrawn. In Fig. 3 it will be seen that one sheet of paper 41 is being withdrawn from the cylinder and that the succeeding sheet of paper 42 overlaps the cylinder in continuous relation thereto to cover up the perforated or slotted zones thereof vacated by the preceding sheet. During this portion of the cycle, the rollers 25 and 26 are moved outwardly and away from the rollers 12 and 13 so that the sheet of paper may move unobstructedly into overlapping relation to the cylinder. Thereafter, the cam 30 will cause the rollers 25 and 26 to move toward the respective take-off rollers 12 and 13, which are being continuously rotated, with the paper sheet frictionally engaged therebetween. This will cause the paper to be slid from beneath the base of the stack and fed between the take-off rollers 14, 12 and 15, 13 whereupon the sheet will be completely removed from the stack. A chute 43 may be provided for the purpose of guiding the removed papers.

It will be observed that upon each rotation of the take-off rollers one and one sheet only will be removed from the base of the stack since only the lowermost paper is subjected to the vacuum action of the cylinder. Moreover, it will be noted that the vacuum take-off comprising the hollow cylinder is stationary and no movement need be imparted thereto, the movement of the paper being effected relative to the stationary member.

If desired, a member may be mounted to rock with the shaft 20 to strike the stack of papers; for example along the edge thereof adjacent the paper guides 10. Movement of this member may occur between the guides 10 and serves to overcome static friction between the stack and the paper being withdrawn therefrom.

In a modified form of our invention, such as that shown in Fig. 4, a valving arrangement may be provided such as a cylindrical valve 44 which is mounted in close fitting relation within the cylinder 4 and may be mounted on and rotated by shaft 6. This valve has a cutaway portion forming the cavity 45 which extends longitudinally thereof throughout the zone of the cylinder embracing the slotted openings 7. Vacuum is supplied to the cavity 45 by means of passageway 46 which in turn communicates through a suitable rotatable coupling with pipe 47 connected with the source of vacuum. The cavity 45 may extend in a peripheral manner throughout substantially 90°. With an arrangement of this character, vacuum is supplied to the lowermost sheet of paper in the same manner as hereinabove described but the vacuum is cut off from the adjacent sheet of paper while the first sheet is being withdrawn and thereafter, as the valve 44 rotates, it will again supply vacuum to the lowermost sheet.

Figs. 5 and 6 illustrate another modification of the present invention which is extremely useful in feeding very thin paper, such as tissue. In this modification a flap or pick 60 forms an arm of bell crank 61 which is actuated by cam 62 fastened to shaft 33. As the bottom sheet of the stack is sucked down over the face of cylinder 4, it frequently happens that the next sheet begins to droop due to its thinness. The rise on cam 62 forces pick 60 to swing upward toward the bottom of the stack of papers being fed. In so doing the pick passes the sheet being fed but straightens any other sheets which are drooping from the bottom of the pack.

The pick 60 remains in its upper position until the bottom sheet is fed into the rollers 14, at which time it returns to its lower position permitting the bottom sheet to be drawn against the face of the cylinder. It then repeats its cycle.

By utilizing such a pick it has been found possible to feed very thin sheets at high speeds without missing a sheet or feeding more than one sheet at a time.

While we have described our invention in its preferred embodiment it is to be understood that the words which we have used are words of description rather than words of limitation and changes may be made within purview of the appended claims without departing from the true scope and spirit of our invention in its broader aspects.

What is claimed is:

1. A feeding mechanism for paper and the like comprising a hollow stationary cylindrical suction member having an inclined surface provided with a plurality of openings communicating between the exterior and interior of said member, means for supporting a stack of papers adjacent said member in a zone thereof adjacent one end of said inclined surface, means for placing the interior of said member under a partial vacuum, and means for gripping the end paper when overlapping said inclined surface and for removing it from the stack comprising a pair of driven rollers mounted coaxially with said cylindrical member, one at each end thereof, and a second pair of rollers mounted adjacent said first pair of rollers and adapted to receive said end paper between said pairs of rollers.

2. A feeding mechanism for paper and the like comprising a hollow cylindrical suction member having an inclined surface provided with a plurality of slots extending lengthwise of said inclined surface and communicating between the exterior and interior of said member, means for supporting a stack of papers adjacent said member in a zone thereof adjacent one end of said inclined surface, means for placing the interior of said member under a partial vacuum, and means for gripping the end paper when overlapping said inclined surface and for removing it from the stack comprising a pair of driven rollers mounted coaxially with said cylindrical member, one at each end thereof, and a second pair of rollers mounted adjacent said first pair of rollers and adapted to receive said end paper between said pairs of rollers.

3. A feeding mechanism for paper and the like comprising a hollow stationary cylindrical suction member having an inclined surface provided with a plurality of openings communicating between the exterior and interior of said member, means for supporting a stack of papers in part upon said members with the unsupported ends of said papers projecting above said inclined surface, means for supplying a partial vacuum to the interior of said member to thereby cause the end paper to overlap said inclined surface, and double roller means mounted coaxially with said hollow stationary cylindrical suction member for gripping the end paper in the zone thereof so separated from the stack and for sliding it from the stack.

4. A feeding mechanism for paper and the like comprising a hollow cylinder having a plurality of peripherally extending slots therein communicating between the exterior and interior of said cylinder, means for supporting a stack of papers to rest upon said cylinder with the lowermost adjacent one end of said slots, means for placing the interior of said cylinder under a partial continuous vacuum, and means for gripping the lowermost paper when overlapping the slotted portion of said cylinder separated in part from the rest of the stack and for removing said paper from the stack.

5. A feeding mechanism for paper and the like comprising a hollow stationary cylinder having a plurality of openings in a portion of its surface, said openings communicating with the interior of said cylinder, means for supporting a stack of papers adjacent said cylinder and adjacent one end of the perforate zone thereof, double roller paper-gripping means mounted coaxially with said hollow stationary cylinder adjacent the other end of the perforate zone of said cylinder, and means for supplying a partial vacuum to the interior of said cylinder.

6. A feeding mechanism for paper and the like comprising a hollow stationary cylinder having a plurality of openings in a portion of its surface, said openings communicating with the interior of said cylinder, means for supporting a stack of papers adjacent said cylinder and adjacent one end of the perforate zone thereof, a pair of cooperating rollers mounted coaxially with said hollow stationary cylinder adjacent the ends of said cylinder and

forming a paper withdrawing means, means for driving one of the pair of cooperating rollers, a roller and means for intermittently moving said roller toward the perforate zone of said cylinder to engage a paper between it and one of said cooperating rollers, and means for supplying a partial vacuum to the interior of said cylinder.

7. A feeding mechanism for paper and the like comprising a hollow stationary cylinder having a plurality of openings in a portion of its surface, said openings communicating with the interior of said cylinder, means for supporting a stack of papers adjacent said cylinder and adjacent one end of the perforate zone thereof, a pair of cooperating rollers mounted coaxially with said hollow stationary cylinder adjacent the ends of said cylinder and forming a paper withdrawing means, means for driving one of the pair of cooperating rollers, a roller and means for intermittently moving said roller toward the perforate zone of said cylinder to engage a paper between it and one of said cooperating rollers, means for supplying a partial vacuum to the interior of said cylinder, and means for timing the operation of the roller-moving means with that of said roller-driving means.

8. A feeding mechanism for paper and the like comprising a horizontally disposed, hollow cylinder having a plurality of peripherally extending slots therein extending from the top of said cylinder and communicating between the exterior and interior of said cylinder, means for supplying a continuous partial vacuum to the interior of said cylinder, means for supporting a stack of papers to rest upon said cylinder with the lowermost adjacent the top end of said slots, paper-gripping rollers disposed to grip one end of a sheet of paper adjacent the other end of said slots, means for continuously driving one of said rollers, and means for temporarily engaging a sheet of paper when overlapping the slotted zone of said cylinder and feeding it between said paper-gripping rollers.

9. A feeding mechanism for paper and the like comprising a hollow curved surface member having at least one peripherally extending aperture therein communicating between the exterior and interior of said member, means for supporting a stack of papers to rest operatively upon said member with the closest paper adjacent and tangent one end of said aperture, means for placing the interior of said cylinder under a partial continuous vacuum between papers, and means for gripping the closest paper when overlapping the slotted portion of said cylinder separated in part from the rest of the stack and means for removing said paper from the stack such that the line of travel of said paper is along said surface.

10. A feeding mechanism for paper and the like comprising a hollow curved surface member having at least one peripherally extending aperture therein communicating between the exterior and interior of said member, means for supporting a stack of papers to rest operatively upon said member with the closest paper adjacent one end of said aperture and tangent to said curved surface, means for placing the interior of said cylinder under a partial continuous vacuum between papers, and means for moving the closest paper when overlapping the slotted portion of said cylinder separated in part from the rest of the stack and for removing said paper from the stack, including means for holding said paper against said surface whereby as the trailing edge of said paper exposes said aperture a second paper is sucked onto said surface in overlapping relation to said first paper.

11. A feeding mechanism for paper and the like comprising a hollow member, means for supporting a stack of papers to contact operatively with said hollow member, said hollow member having an aperture therein, said aperture extending along the surface of said hollow member at the point where said stack contacts said hollow member, means for placing the interior of said member under a partial continuous vacuum between papers, and means for moving the paper closest said hollow member when overlapping said aperture from said stack, including means for holding said paper against the surface of said hollow member throughout the apertured area.

References Cited in the file of this patent

UNITED STATES PATENTS

525,999	Reising	Sept. 11, 1894
1,192,915	Lorenz	Aug. 1 1916
1,792,149	Duncan et al.	Feb. 10, 1931
1,804,611	Halvorsen	May 12, 1931
2,331,533	Bishop	Oct. 12, 1943