March 18, 1958 D. W. REED, JR 2,827,289

PAPER FEEDING MECHANISM

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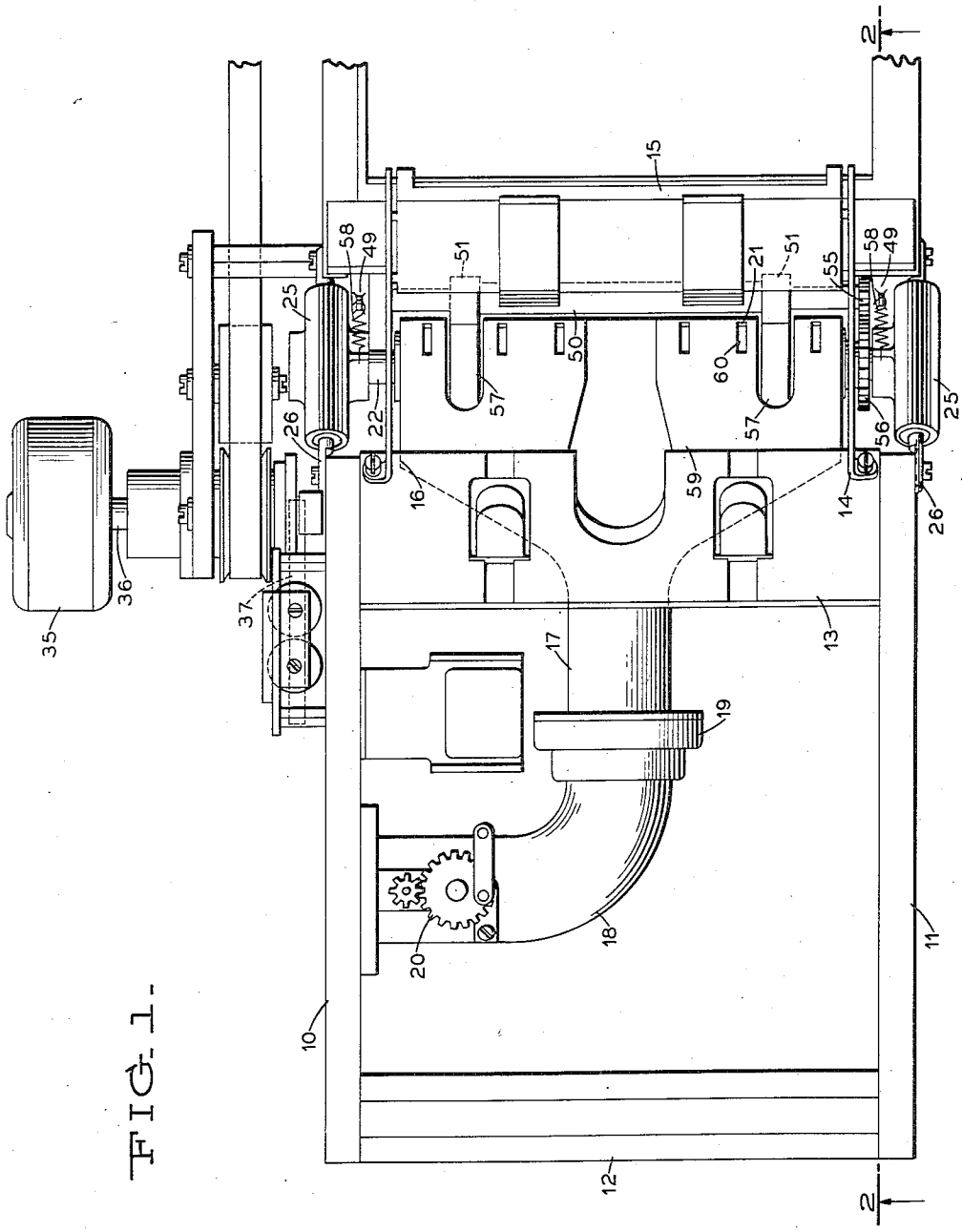


FIG. 1.

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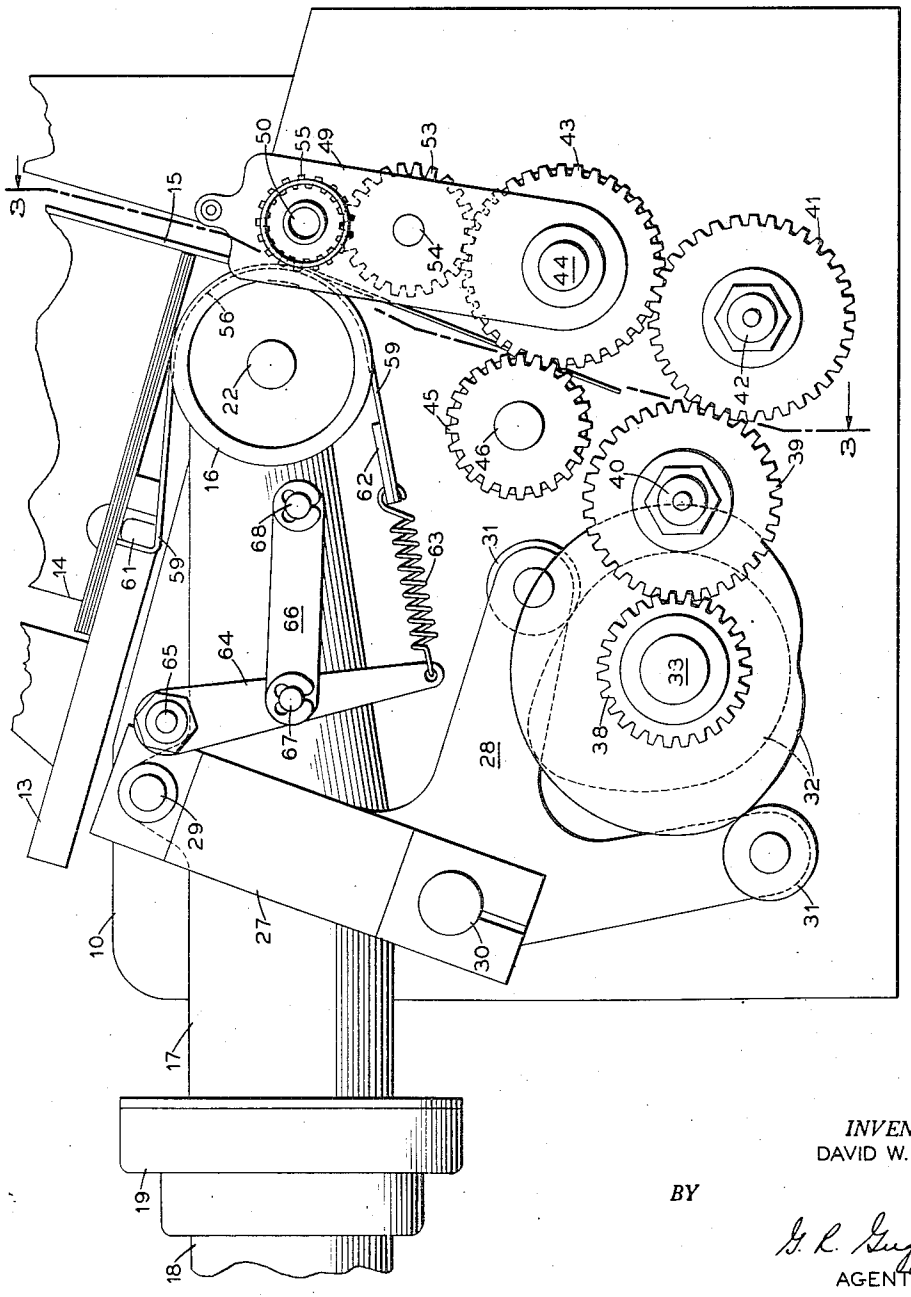


FIG. 2.

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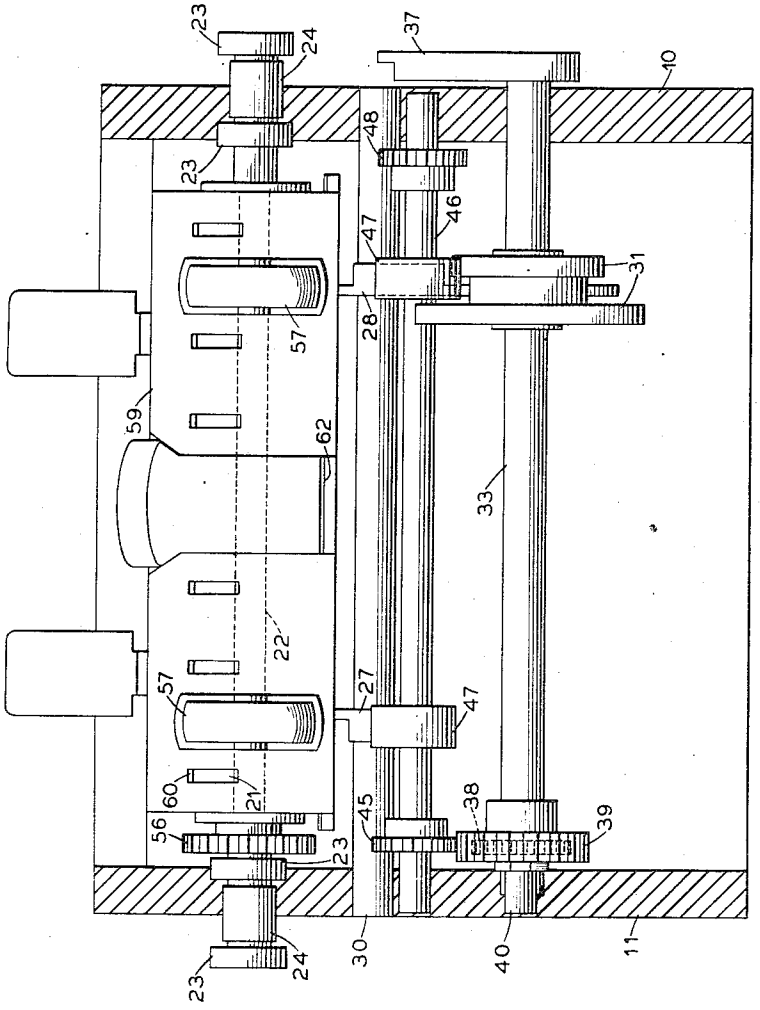


FIG. 3.

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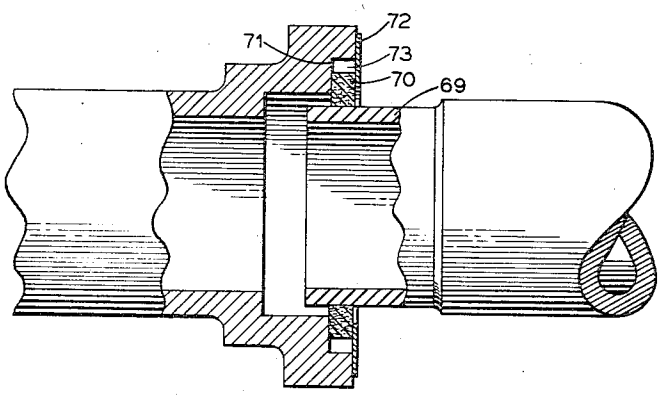


FIG. 4

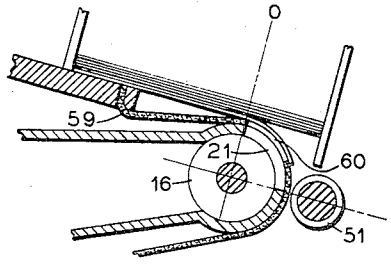


FIG. 5a

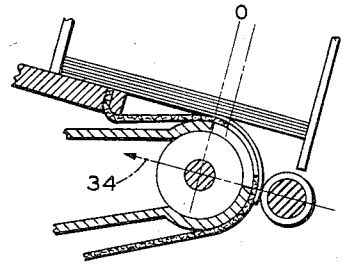


FIG. 5b

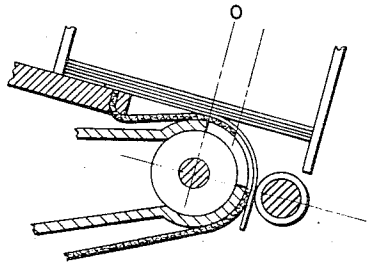


FIG. 5c

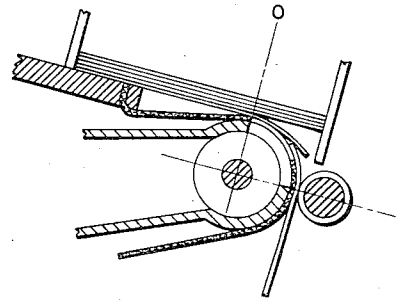


FIG. 5d

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2,827,289

PAPER FEEDING MECHANISM

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Application August 25, 1955, Serial No. 530,583

13 Claims. (Cl. 271—29)

The present invention relates to a device 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 mechanisms and the like.

One of the principal objects of this invention is to provide a paper feeding mechanism which comprises a vacuum type take-off, the take-off functioning to peel 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 device of the foregoing character and including novel means for obtaining rolling motion to effect the peeling off of a sheet.

A further object of the present invention resides in providing, in a paper feeding mechanism, a vacuum type take-off device of the foregoing character wherein a simple and limited reciprocating movement is all that need be provided to the device to effect the separation of a sheet in its entirety from the stack.

Another object of the present invention resides in providing, in a paper feeding mechanism, an improved vacuum type take-off device which is simpler to construct, easier to service and quieter in operation.

A still further object of the present invention is to provide in a paper feeding mechanism, an improved vacuum type take-off device which maintains improved registration of the sheet by peeling it into the bite of take-away feed rolls before the sheet has left the hopper.

More particularly, the invention provides a paper feeding mechanism comprising a hollow arcuate vacuum chamber on which a stack of papers may rest, said chamber having port openings therein adjacent the stack for effecting a partial separation of the bottom or outermost sheet from the stack. Additionally, there is provided a mechanism of this character comprising a sheet or curtain wrapped around the arcuate surface of said chamber and having port openings in registry with the port openings in the chamber, and wherein the chamber is cam driven along a line parallel to the plane of the stacked sheets, the curtain sliding forward over the arcuate surface of the chamber to peel a sheet from the bottom of the stack. The invention further provides a paper feeding mechanism of the foregoing character including take-off rollers which follow the reciprocating motion of the suction chamber for feeding partially separated sheets entirely from the stack.

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 example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a partial plan view of a machine embodying the present invention.

Fig. 2 is a side elevation view taken on line 2—2 of Fig. 1 to illustrate various driving instrumentalities.

Fig. 3 is a front elevation view taken on line 3—3 of Fig. 2.

Fig. 4 is a partial sectional view of the vacuum chamber showing details of the elbow connector and seal.

Figs. *5a–5d* are a series of diagrammatic views illustrating the manner of operation of the present invention.

Referring to Fig. 1, the machine embodying the present invention comprises a frame having side members **10** and **11** and a rear member **12**. Joining the side members is a plate **13** which forms a partial baseplate of a hopper for holding a stack of paper sheets, said hopper also including a pair of side plates **14** fastened to the baseplate and a front plate **15** fastened to the side plates. In the embodiment illustrated the vacuum type take-off is shown as a casting comprising a hollow cylinder portion **16** and a plenum chamber portion **17** connected to a vacuum supply pipe **18** through a flexible seal connector **19**. The vacuum supply pipe is fastened to the side member **10** and communicates with a suitable source of vacuum through a control valve **20**.

The cylinder **16** is in part perforated, being provided with a plurality of slotted openings or ports **21** which extend from the top of the cylinder peripherally thereof for approximately 45 degrees. The ports are arranged to underlie the leading unsupported portion of the stack of sheets, the stack of sheets being supported rearwardly by the hopper baseplate **13** and the top of cylinder **16**.

The vacuum take-off casting is supported in the front by a shaft **22** (Fig. 3) extending through the cylinder **16**, the shaft **22** being rotatable on end bearings **23** and spacers **24** mounted in a pair of housing members **25** (Fig. 1). The housing members are slideably mounted on a pair of rods **26** fastened to the side members of the machine to facilitate reciprocation of the cylinder and plenum chamber. Rearward support for the casting is provided by a lever arm **27** (Fig. 2) and a bellcrank member **28** which are pivoted to opposite sides of the plenum chamber by a pin connection **29**.

The lever arm **27** and bellcrank member **28** are fixed on opposite ends of a pivot shaft **30** rotatable in the side members of the machine and the bellcrank member carries two rollers **31** which are acted upon by a pair of complementary cams **32** fixed on a shaft **33** rotatably mounted in the side members of the machine. The cams, bellcrank member and lever arm serve as a means to reciprocate the vacuum take-off unit back and forth along a line, indicated at **34** in Fig. *5b*, which is parallel to the plane of the paper sheets in the hopper. The drive for shaft **33** is taken from a motor **35** having a motor shaft **36** connected to the shaft **33** by any suitable clutch member **37**.

Feed roll drive connections are established with shaft **33** through a gear **38**, fixed on shaft **33** and which drives an idler gear **39** rotatable on a stud **40** fixed to the side member **11**. Idler gear **39** drives another idler gear **41** rotatable on a stud **42** which in turn serves to drive one of a pair of gear feed rolls **43** (Fig. 2) rotatable on each half of a split shaft **44** fixed to the side members of the machine. Gear feed roll **43** drives a gear **45** fixed on a shaft **46** rotatable in the side members of the machine, said shaft carrying a pair of feed rolls **47** which cooperate with the feed rolls **43** to feed a separated sheet. A gear **48** fixed on the other end of shaft **46** serves to drive the other gear feed roll **43**.

Pivoted at each end of the split shaft **44** is a link **49**, the pair of links **49** serving to rotatably support a shaft **50** which carries a pair of take-away feed rolls **51**. A gear **55** (Fig. 1) fixed on shaft **50** is driven from one of the gear feed rolls **43** through an idler gear **53** rotatable on a stud **54** fixed to one of the links **49**, said gear

55 (Fig. 1) serving to drive a gear 56 fixed on the cylinder shaft 22. The shaft 22 carries a pair of take-away feed rolls 57 which cooperate with the rolls 51 and the rolls 51 are urged into contact with rolls 57 throughout the reciprocatory movement of the cylinder and plenum chamber by a pair of springs 58 extending between the links 49 and the housing members 25. The rolls 57 rotate within recessed portions of the chamber and a suitable sealing connection is provided between shaft 22 and the chamber to prevent loss of the vacuum.

The novel means for obtaining a rolling or sliding motion to effect the peeling off of a sheet from the stack includes a plastic sheet or curtain 59 wrapped around the suction cylinder 16 and having slots or ports 60 in registry with the slots 21 in the cylinder. The curtain is fastened at one end to a block 61 (Fig. 2) suitably attached to the plate 13 and has secured at its other end a plate member 62 which serves as an anchor for a pair of springs 63.

The springs 63 further connect to a pair of arms 64 pivoted to the side frames of the machine by a pin connection as at 65, Fig. 2. The arms 64 are connected to the plenum chamber 17 through a pair of links 66 which are pivoted to the arms by pin connections 67 and to each side of the chamber by pin connections 68.

It can be seen that as the cylinder 16 is reciprocated back the curtain will move back with the cylinder, the curtain in effect sliding forward over the arcuate surface of the cylinder to advance a partially separated sheet. As the plenum chamber moves back the above-described linkage causes the lower ends of the arms 64 to move back the same distance that the curtain will move back. Thus, the linkage serves to maintain a constant tension on the springs 63 and insures proper movement of the curtain.

Referring to Fig. 4, it may be seen that the movement of the vacuum take-off device is taken up in the connector 19 by allowing the tubular portion 69 of the plenum chamber to slide in a sealing ring 70 which is held against the inner flanged surface 71 of the connector by a retaining plate 72. A clearance space 73 is provided to allow for vertical movement of the ring 70 as the take-off unit reciprocates.

In operation, as shown in Figs. 5*a*–5*d*, the stack of papers will rest upon the top of the curtain 59 and the cylinder 16. Vacuum supplied to the interior of the cylinder will cause a portion of the lowermost sheet of paper to separate from the bottom of the stack, starting from a point adjacent the upper end of the registered slots 21 and 60, wrapping the separated portion of the sheet around the arcuate surface of the cylinder, as shown in Fig. 5*a*.

Next, the cams 12 operate to move the take-off unit back along the line indicated at 34 in Fig. 5*b*, during which movement the partially separated sheet and curtain slide as a unit over the arcuate surface of the cylinder to project the leading edge of the sheet into the feed rolls 51. It will be noted that the sliding forward of the curtain and the sheet is a free motion obtained by simply moving the take-off unit back in one direction and no auxiliary feed devices requiring additional driving means are necessary to move the partially separated sheet relative to the stationary unit and into the feed rolls.

Fig. 5*c* shows the vacuum take-off unit at the end of its rearward travel with the partially separated sheet being transported by the take-away feed rolls 51 and 57, which cooperate as previously described in connection with Fig. 1.

In Fig. 5*d*, the take-off unit has been returned by the cams 12 back to its home position by which time the bottom sheet will have been entirely separated from the stack by feed rolls 51, 57 and will have advanced sufficiently to allow the trailing edge thereof to expose the slots in the curtain and cylinder. As a result, a portion of the next sheet is immediately separated from the stack and wrapped around the arcuate surface of the cylinder in overlapping relationship with the first sheet. Progressive overlapping separation of the sheets continues in this manner.

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 curved-surface member, a flexible covering for said member, means for supporting said covering in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum, and means for effecting sliding motion of said covering around said member to remove papers one at a time from said stack.

2. A feeding mechanism for paper and the like comprising a hollow curved-surface member having a plurality of peripherally extending slots therein providing communication between the exterior and interior of said member, a flexible covering for said member including a plurality of slots, means for supporting said covering in wrap-around fashion on the curved surface of said member with the slots in said covering in registry with the slots in said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from said stack and adhere to said covering, means for moving said member, and means for moving said covering around said member to peel the partially separated end paper from said stack.

3. A feeding mechanism for paper and the like comprising a hollow curved-surface member having a plurality of peripherally extending slots therein providing communication between the exterior and interior of said member, a flexible covering for said member including a plurality of slots, means for supporting said covering in wrap-around fashion on the curved surface of said member with the slots in said covering in registry with the slots in said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from said stack and adhere to said covering, means for moving said member rearwardly of said stack, and means pulling on one end of the covering to effect a sliding movement of said covering along the surface of said member to peel said paper from the stack.

4. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering for said member, means for supporting said covering in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for moving said member rearwardly

and substantially parallel to said papers and connecting means between said member and covering for causing said covering to slide around the surface of said member during movement of the latter to peel the partially separated paper from the stack.

5. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for moving said member rearwardly and substantially parallel to said papers, means for fixing one end of said covering against movement, and connecting means between the other end of said covering and said member for causing said covering to slide around the surface of said member during movement of the latter to peel the partially separated paper from the stack.

6. A feeding mechanism for paper and the like comprising a hollow curved-surface member having a plurality of peripherally extending slots therein providing communication between the exterior and interior of said member, a flexible covering for said member and including a plurality of slots, means for supporting said covering in wrap-around fashion on the curved surface of said member with the slots in said covering in registry with the slots in said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from said stack and adhere to said covering, a pair of driven rollers mounted with said member, a second pair of driven rollers mounted adjacent said first pair of rollers, and means for effecting sliding movement of said covering around the surface of said member to advance said partially separated paper between said rollers, said rollers being adapted to remove said paper entirely from the stack.

7. A feeding mechanism for paper and the like comprising a hollow curved-surface member having a plurality of peripherally extending slots therein providing communication between the exterior and interior of said member, a flexible covering for said member and including a plurality of slots, means for supporting said covering in wrap-around fashion on the curved surface of said member with the slots in said covering in registry with the slots in said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from said stack and adhere to said covering, a pair of driven rollers mounted with said member, a second pair of driven rollers adjacent said first pair of rollers, a movable support for said second rollers, means for moving said member and first rollers rearwardly of said stack, means connecting said movable support and said member to allow said second rollers to follow the movement of said first rollers and remain adjacent thereto, and connecting means between said covering and said member for causing said covering to slide around the surface of said member during movement of the latter to advance said partially separated paper between said rollers, said rollers being adapted to remove said paper entirely from the stack.

8. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for moving said member rearwardly of said stack, means for fixing one end of said covering against movement, a yieldable connection between the other end of said covering and said member for causing said covering to slide around the surface of said member during movement of the latter to peel the partially separated paper from the stack, and means on said member for maintaining said yieldable connection under constant tension during movement of said member and covering.

9. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for moving said member rearwardly of said stack, means for fixing one end of said covering against movement, and connecting means between the other end of said covering and said member for causing said covering to slide around the surface of said member during movement of the latter to peel the partially separated paper from the stack, said connecting means including a pair of springs connected to said covering and linkage connected between said springs and said member for maintaining constant tension on said springs during movement of said member and covering.

10. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for reciprocating said member, means for fixing one end of said covering against movement, and connecting means between the other end of said covering and said member for causing said covering to reciprocate along the surface of said member during movement of the latter to separate papers one at a time from the stack.

11. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for reciprocating said member along a line parallel to the plane of said stacked sheets, means for fixing one end of said covering against movement, and connecting means between the other end of said covering and said member for causing said covering to reciprocate around the surface of said member during

movement of the latter to peel papers one at a time from the stack.

12. A feeding mechanism for paper and the like comprising a hollow curved-surface member, a flexible covering supported in wrap-around fashion on the curved surface of said member, said covering and member including a plurality of slots in registry and providing communication between the exterior and interior of said member, means for supporting a stack of papers in part on said covering and member with the unsupported ends of said papers adjacent said slots, means for placing the interior of said member under a vacuum to cause a portion of the end paper to separate from the stack and adhere to said covering, means for reciprocating said member, means for fixing one end of said covering against movement, connecting means between the other end of said covering and said member for causing said covering to reciprocate along the surface of said member, said covering moving in one direction to peel said partially separated sheet, and auxiliary feeding means for removing said peeled sheet entirely from the stack, said covering moving in the opposite direction during said removal to position the slots therein between the slots in said member and a second paper in the stack for partially separating said second paper in overlapping relation to said first paper.

13. In a sheet feeder for feeding sheets one at a time from a stack, a hollow curved-surface member, a flexible curtain partially wrapped around said member, means to hold the stack of sheets so that one end sheet of the stack bears against the wrapped portion of said curtain, means to evacuate said member, said member and said curtain having registering slots so located with reference to a marginal portion of said end sheet of the stack that said marginal portion is drawn by the vacuum within said member against said curtain, means to anchor one end of said curtain adjacent the stack, means to reciprocate said member substantially parallel to the sheets of the stack, and means pulling on the opposite end of the curtain to hold it in contact with said member, whereby as said member moves in one direction said curtain follows and slides around said member and said end sheet is peeled from the stack.

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