

Nov. 25, 1958

J. HALAHAN ET AL
SHEET FEEDING MEANS

2,861,803

Filed June 16, 1955

2 Sheets-Sheet 1

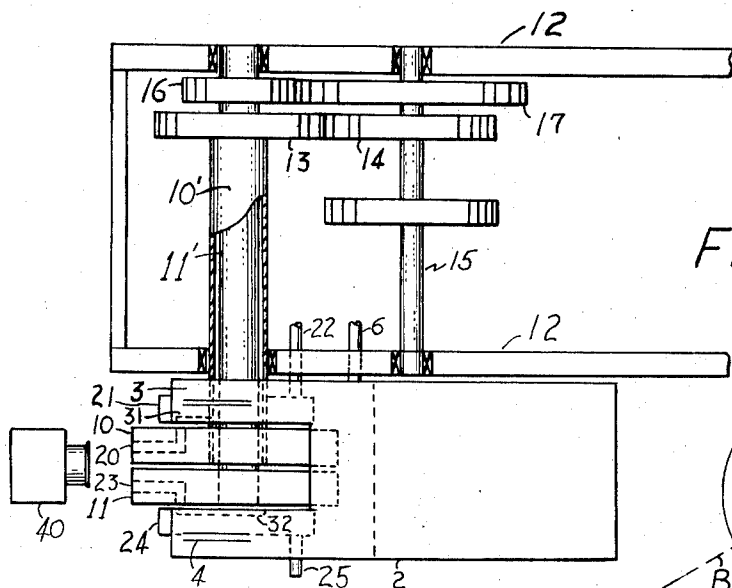


Fig 2

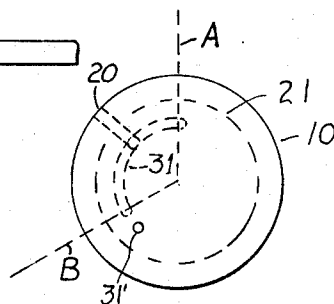


Fig 3

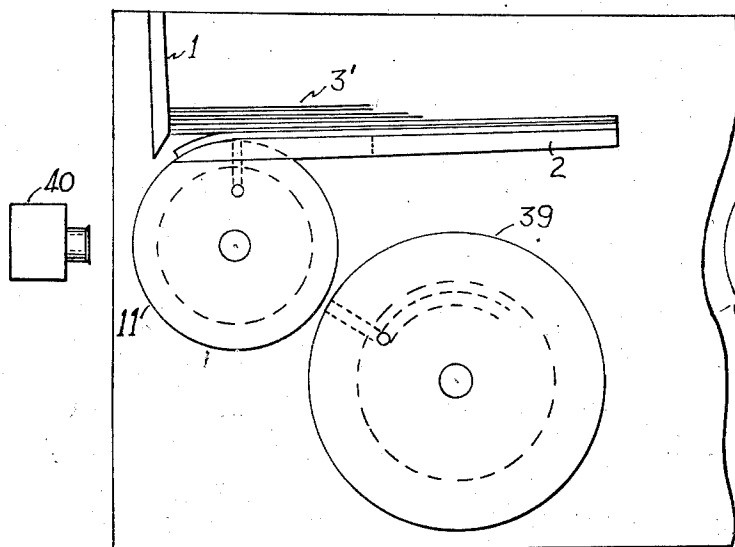


Fig 1

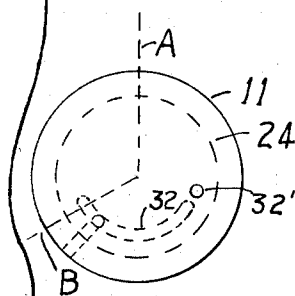


Fig 4

INVENTORS

JOHN HALAHAN
THEODORE F. ARONSON
FLOYD A. LYON

Nov. 25, 1958

J. HALAHAN ET AL
SHEET FEEDING MEANS

2,861,803

Filed June 16, 1955

2 Sheets-Sheet 2

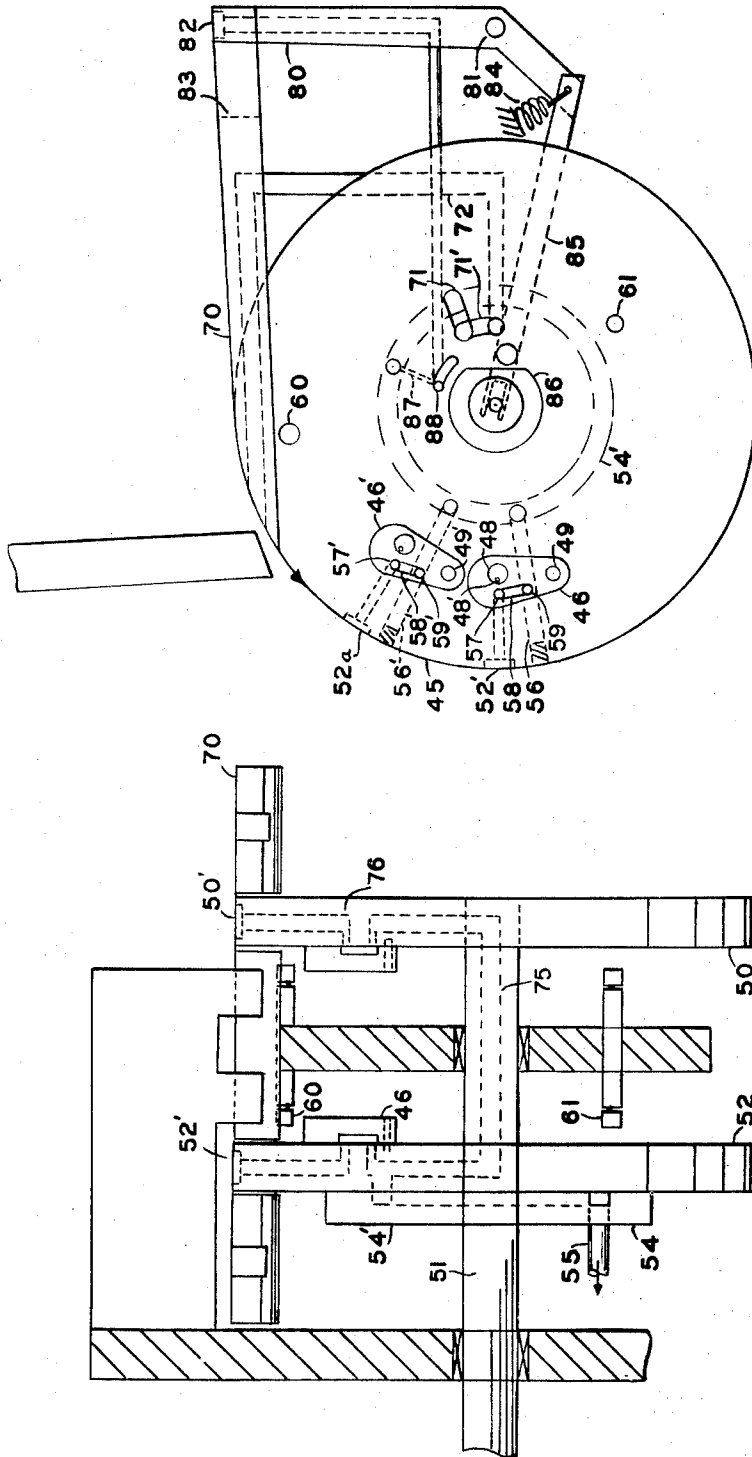


FIG 5

FIG 5A

INVENTORS

JOHN HALAHAN
THEODORE F. ARONSON
FLOYD A. LYON

1

2,861,803

SHEET FEEDING MEANS

John Halahan, Brookville, Theodore F. Aronson, Glen Cove, and Floyd A. Lyon, Brookville, N. Y.

Application June 16, 1955, Serial No. 517,292

11 Claims. (Cl. 271—29)

This invention relates to means for feeding sheet material such as papers from a stack and more particularly to such means adapted to handle said sheets, without any possibility of damage.

More specifically, the present invention relates to high speed means for separating and removing papers from a stack; for instance, a stack of checks. In one embodiment, means are also provided to move the papers at a slower speed during a predetermined portion of the travel, so that the papers may be read and scanned by an optical reader during the slow portion without interfering with the overall high speed of operation.

The invention generally comprises a rack having a platform which is adapted to hold a stack of papers such as checks. The forward portion of the platform has a curved portion inclined away from the plane of the closest paper. This curved portion is hollow and apertured, and a source of vacuum is connected to the hollow portion. Due to the fact that the plane of the aperture falls away from the plane of the nearest paper, i. e. of the stack, and due to the action of the vacuum, the leading edge of the closest paper is peeled away from the stack and attracted to the curved surface of the platform.

The center of the platform has a slot in which are one or more rotatable wheels. The wheels or discs have ports on their surface, and the surfaces of the wheels are tangent to the curvature of the platform lip. The ports on the pick-up wheels are connected to a source of vacuum with suitable valving which will be discussed later. Therefore, the peeled off paper will be picked up by the pick-up discs and removed from the stack. The second paper in the stack will then be peeled off in overlapping relation to said first paper in a continuous progressive sucking action as the apertures 3 and 4 are exposed by the trailing edge of said first paper.

In a two speed embodiment the paper is picked up by a slow speed wheel and at a predetermined later time, for instance, 120° of travel, the slow speed wheel is valved off and a higher speed wheel is valved on, so that the paper is transferred from a slower speed wheel to a higher speed wheel.

The purpose of having the slower speed is that during the slow period, the check or paper may be scanned by an optical scanner for the purpose of reading the information on it. Since the amount of the slow travel is relatively small, it will not appreciably effect the overall speed of the high speed system.

The papers are held only by vacuum pressure and there are no rollers or fingers in which the papers could jam or be torn. If a paper slips, it will merely fall to the table undamaged.

Due to the vacuum handling, there is no possibility of damage. Even business forms of combined sheets and carbon may be fed without the carbons marking the papers.

Accordingly, the principal object of the invention is

2

to provide new and approved sheet handling and feeding means.

Another object of the invention is to provide new and improved high speed sheet feeding means without any possible damage to the sheets.

Another object of the invention is to provide new and improved dual speed sheet handling means.

Another object is to provide new and improved multi-speed sheet handling means.

Another object of the invention is to provide vacuum means for removing sheets from a stack, including means for peeling the closest sheet from the stack and means for removing said sheet from the stack without any mechanical gripping of the sheets; for instance, by rollers or fingers.

Another object of the invention is to provide sheet feeding means utilizing continuous progressive sucking of the sheets from a stack.

Another object of the invention is to provide a sheet feeder having novel pull-back sheet straightening means.

Another object of the invention is to provide means for supporting a stack of sheets, said means having a hollow apertured lip portion inclined away from the closest of said sheets, a source of vacuum connected to said hollow lip portion for peeling the closest sheet from said stack; said lip having a recessed slot portion, rotatable pick-up means located in said apertured lip portion substantially tangent to the upper surface of said lip portion; said pick-up means having a port on its surface, a source of vacuum connected to said portion whereby as said pick-up means rotates past said lip portion, said sheet which has been peeled off is picked up.

These and other objects of the invention will be apparent from the following specification and drawings of which,

Figure 1 is a side view of an embodiment of the invention,

Figure 2 is a top view of the embodiment of Figure 1, Figures 3 and 4 are detail views of the embodiment of Figures 1 and 2,

Figures 5 and 5A are front and side views of another embodiment of the invention,

Referring now to Figures 1 and 2, the invention comprises a forward stop 1 having a platform 2 which is adapted to hold a stack 3' of sheets such as checks. The forward portion of the platform has a curved portion which is inclined away from the closest paper in the stack. This forward portion is hollow and is apertured by two slots, 3 and 4, and the hollow chamber is connected to a source of vacuum by means of the tube 6. The vacuum chamber may be valved as shown in Figure 5. The curved lip portion has a recessed slot in its center and a pair of rotatable pick-up wheels 10 and 11 are mounted in this slot. The wheels are of the same radius and are mounted coaxially with their surface tangent to the upper curved surface of the platform 2. The wheel 11 is mounted on the shaft 11' which is rotatably mounted on the frame 12 inside the sleeve 10'.

The other wheel 10 is mounted on sleeve 10' which is rotatably mounted on the frame 12. The wheel 10 is adapted to be driven at a first slow speed by means of the sleeve 10' and the gear 13 which is connected to gear 14 which is mounted on the main drive shaft 15.

The wheel 11 is adapted to be driven at a higher speed; for instance, four times the speed of the first wheel 10 by means of the shaft 11' through the gears 16 and 17 which connect it to the main driven shaft 15. The relative speeds of the wheels may be predetermined by selecting the proper gear ratios. The wheel 10 has at least one port 20 in its outer surface, and this port is connected to a source of vacuum through a valve 21 which

3

has a slotted connection with the port 20 as will be explained. The valve 21 is connected to a source of vacuum by means of the tube 22.

The wheel 11 has at least one port 23 on its outer surface which is connected to a source of vacuum through the valve 24 and the pipe 25. The valve 24 has a curved slot therein which connects with the port on the wheel 11. By locating the portion and length of the slots in the valve members, the different wheels may be valved with the vacuum at any predetermined time sequence.

The valve members 21 and 24 are shown in Figures 3 and 4. They may be stationary hollow members which are connected to a source of vacuum, and which have slotted outputs connecting with the respective ports of the pick-up wheels. The valve 21 has a slot 31 extending approximately 120°. Therefore, when the port 20 is in the plane of the line A, it will be connected to a source of vacuum through the slot 31, and will be connected until it rotates past the plane of the line B, at which time the port is vented by vent hole 31'.

The valve 24 is a hollow member connected to a source of vacuum having a curved slot 32 which connects with port 23 of the high speed wheel 11. Therefore, when the vacuum is turned off the slow speed wheel, it is turned on to the high speed wheel until the end of slot 32 when the port is vented by vent hole 32', and the paper being carried will be transferred from one wheel to the other, and change its speed at the plane of the line B.

The operation of the invention thus far is as follows:

The lowest or closest paper of the stack will be partially separated from the stack, since the curved portion of the supporting platform has a vacuum applied to it. As the slow speed wheel rotates, as it comes to the position shown by the line A, it will be energized by a vacuum through the slot 31, and will pick up the first paper and will carry it around counterclockwise. During this slow speed portion, information on the paper may be read by means of the reader 40. When the port 20 gets to the plane B, the paper will be transferred from the low speed wheel to the high speed wheel, since the vacuum will be turned off the slow speed wheel by the termination of the slot 31, and the vacuum will be turned on the high speed wheel by the beginning of the slot 32 in valve 24. The high speed wheel should have an integral speed with relation to the lower speed wheel, and the wheels should be adjusted so that the ports on the respective wheels coincide in the plane B.

The paper will then be carried and may be transferred to another takeaway wheel 39 having a similar valved port for further operation such as sorting, counting, or the like which may be controlled by information read by the reader 40. However, this is beyond the scope of the present invention which is limited to the paper separating and removing means above described. The transfer can preferably be made by vacuum. The wheels may be spaced and do not have to act as rollers.

The pick-up wheels are shown as having one port each, but are not so limited and may have more than one port, depending upon the size of the paper desired to be handled.

Figures 5 and 5A illustrate another single speed embodiment of the invention. In this embodiment the valving of the takeaway wheel 45 is provided by a pivoted valve 46 which is pivotally mounted on the wheel 45 at the point 49.

Figure 5A is a side view of the embodiment of Figure 5 showing two suction wheels 50 and 52 mounted on the shaft 51. A stationary plastic plate 54 having circular slot therein, 54', Figure 2, is mounted against the wheel 52. The plate is made of plastic to eliminate metal to metal friction. The vacuum is supplied from a source through the pipe 55 through the circular slot 54' to the port 52' of the wheel 52.

Referring to Figure 5, the circular slot 54' is under

4

continuous vacuum and the port 52' is connected through the pivoted valve 46 and the plugged channel 56 to the vacuum slot 54'. Specifically, the port 52' is connected to a small hole 57 which is connected via the slot 58 in the pivoted valve to the small hole 59 connecting to the vacuum channel 56. Therefore, when the pivoted valve is in the position shown, vacuum will be connected to the port 52'. The pivoted valve is placed in this position about its point 49 by means of the fixed pin 60 mounted on the frame. Therefore, just after the position of the fixed pin 60, vacuum will be applied to the port 52' to remove the closest sheet from the stack.

The fixed pin 61 will rotate the pivoted valve to the vacuum off position, as the pivoted valve passes it.

When the valve 46 is turned to the off position by the pin 61, the vacuum will be shut off to the port 52', and the port 52' will also be vented through the hole 48 in the valve 46. The small pin 48' is a stop pin to stop over-travel of the valve.

This venting of the port has several advantages since it releases the vacuum on the port instantaneously and permits definite transfer of the papers. The only amount of vacuum loss is that stored in the connection to the port 52' so there is no great amount of vacuum lost. For high speed operation it is necessary to release the vacuum quickly; otherwise, the residual vacuum might hold the paper beyond the desired point. The valve plate 46 is preferably made of a fibre or plastic material to reduce friction. The small amount of chamber between valve and port gives the quick action when valve turns on suction or vents the port 52'. This small amount of chamber is made possible by placing the valve as close as possible to the port being controlled thereby reducing to a minimum the chamber having to be evacuated or vented to atmosphere.

In this embodiment the vacuum to the platform member 70 is also valved so that the pick-up wheel will not have to work against suction on the platform. The vacuum to the platform chamber is provided through the circular slot 54' through the connecting slots 71 and 71' in the disc 54 and the connecting pipe 72. Therefore, vacuum is provided on the hollow lip portion of the platform during the travel of the slot 71 along the transverse slot 71' which is connected to the continuous source of vacuum in the circular slot 54'. The position of the slot 71' is chosen to apply vacuum to the bottom paper of the stack just before the previous paper has cleared the stack. In this way, the pick-up wheel vacuum will have to work against drag caused by vacuum on the platform lip only for a minimum amount and will still get progressive suction on the following sheet. The friction of the lip vacuum is not present at the time of pick-up when a sheet has to be snatched out of stack. Also, immediately thereafter, there is another port dragging the sheet plus the extra friction grab of wrap around the pick-up wheel.

There is another port 52a which contacts the paper immediately after the first port. This port also has a valve 46' similar to the valve 46 and operates in the same manner. The purpose of the second port is to strengthen the pick-up force of the vacuum and also to hold the paper as it is being transferred to another wheel, for instance, wheel 39 in Figure 1. In this way, at the transfer point the paper is held by the second port and the transfer is accomplished in two stages: first, the first port lets go and the paper is attracted to the second wheel, and second, the second port lets go, completing the transfer to the second wheel. The use of two ports is not absolutely necessary but does provide greater control over the handling of the papers if that is desired in a particular application.

The vacuum on the wheel port 52' is applied from the position of the fixed pin 60 until the position of the fixed pin 61 which shuts off the vacuum and allows the paper to be transferred to another wheel.

5

Vacuum to the wheel 50 is applied through the hollow bore 75 to the bore 76 connecting to the port 50' on the wheel 50. Therefore, the wheel 50 will be valved in the same manner as the wheel 52.

Figure 5 shows a detail view of the novel pull-back means for straightening papers in the stack. When there is a lip on the lower part of the front guide, it is necessary to pull back the lower paper to clear the lip. In certain other applications it is desirable to do this even if there is not any lip on the front guide. For instance, in feeding business forms where several pieces of tissue and carbon are glued together at the leading edge, there is a tendency for the leading edge to curl up and away from the suction member. In order to avoid this, we have provided a suction member acting on the rear portion of the lower sheet which tends to pull it back and straighten the paper out so that it will be properly attracted by the takeaway suction member. This pull back also relieves the wedge pressure of bottom sheet against the forward stop and suck down is made easier.

The pull-back member comprises a hollow tube 80 which is connected to a source of vacuum which is pivotally mounted on the frame at the point 81 and has a port 82 which is adapted to oscillate in a slot 83 cut in the platform 70. The pull-back suction member is spring loaded by the spring 84 and is connected by means of the linkage 85 to a cam 86 which is fixed to shaft 51. Therefore, on each rotation of the cam 86, the suction member oscillates towards the rear edge of the paper and pulls back the lowest paper. Slot 88 and connecting bore 87 are preferably provided to valve the vacuum on and off in the rear pull back suction member just before the vacuum on the takeaway wheel starts to move the sheet forward.

The pull-back motion is preferably made just before the vacuum on the takeaway wheel starts to move the sheet forward. The motion and valving are also preferably designed to hold the second sheet stationary while the bottom sheet is being removed.

A paper sorting machine utilizing the present feed is disclosed in our co-pending application S. N. 515,936, filed June 16, 1955, for Sheet Handling and Sorting Means.

We claim:

1. A feeding mechanism for sheets comprising a hollow curved surface member having a recess and having at least one peripherally extending aperture therein communicating between the exterior and interior of said member, means for supporting a stack of sheets to rest operatively upon said member with the closest sheet adjacent and tangent one end of said aperture, means for placing the interior of said hollow curved surface member under a partial vacuum between overlapping sheets to peel off the leading edge of a following sheet from said stack and movable pick-up means in said recess having a surface in the same plane as said hollow curved surface, said pick-up means having at least one port on its surface, a controlled source of vacuum connected to said port whereby as said pick-up means moves past said hollow curved surface, said sheet which has been peeled off said stack is picked up by said pickup means and removed from said stack so that the line of travel of said sheet is along said curved surface member.

2. A feeding mechanism for paper and the like comprising a hollow member having a recess, means for supporting a stack of sheets to contact operatively with said hollow member, said hollow member having at least one 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 sheets and movable pick-up means located in said recess and having a surface in the same plane as said hollow surface, said pick-up means having at least one port on its surface, a controlled source of vacuum

6

connected to said port whereby as said pick-up means moves past said hollow surface said sheet closest said hollow member when overlapping said aperture is picked up by said means and removed from said stack, and means for holding said sheet against the surface of said hollow member throughout the apertured area.

3. Means for feeding sheets, comprising a platform for supporting a stack of sheets, said platform having having a hollow apertured lip portion inclined away from the closest of said papers, a source of vacuum connected to said hollow lip portion for peeling the closest paper from said stack, rotatable pick-up means located adjacent said apertured lip portion and coplanar with the upper surface of said lip portion, said pick-up means having at least one port on its surface, a source of vacuum connected to said port, whereby as said pick-up means rotates past said lip portion, said paper which has been peeled off the stack is picked up by said means, said pick-up means comprising a slow speed disc and a higher speed disc, said discs having vacuum ports therein, and means to valve said ports to transfer papers between discs.

4. Sheet handling means comprising a platform for supporting a stack of papers or the like, said platform having a hollow apertured lip portion inclined away from the closest of said papers, a source of vacuum connected to said hollow lip portion for peeling the closest paper from said stack, a rotatable pick-up disc adjacent said apertured lip, and substantially tangent the upper surface of said lip portion, said disc having a port on its surface, a source of vacuum connected to said port, whereby as said disc rotates past said lip portion, said paper which has been peeled off the stack is picked up by said disc, a rotatable takeaway disc mounted substantially coaxial with said pick-up disc, said takeaway disc having a vacuum port in its surface and means to valve said vacuum to said pick-up disc, whereby papers are transferred from said pick-up disc to said takeaway disc.

5. Sheet handling means comprising a platform for supporting a stack of papers or the like, means to peel off the leading edge of the closest paper in said stack comprising a hollow apertured curved portion of said platform, a source of vacuum connected to said hollow lip portion for peeling the closest paper from said stack, said lip having a recessed slot portion, a rotatable pick-up disc located in said apertured lip slot portion substantially coplanar with the upper surface of said lip portion, said disc having at least one port on its surface, a source of vacuum connected to said port, means for pulling back the bottom sheet of said stack, whereby as said disc rotates past said lip portion, said paper which has been peeled off the stack is picked up by said disc and a second paper is peeled off in overlapping relation in a continuous progressive sucking action.

6. Sheet handling means comprising a platform for supporting a stack of papers or the like, said platform having a hollow apertured lip portion inclined away from the closest of said papers, a source of vacuum connected to said hollow lip portion for peeling the closest paper from said stack, rotatable pick-up means located adjacent said apertured lip portion and substantially tangent the upper surface of said lip portion, said means having at least one port on its surface, a source of vacuum connected to said port, whereby as said means rotates past said lip portion, said paper which has been peeled off the stack is picked up by said means, a high speed rotatable disc mounted coaxial with said pick-up means, said high speed disc having at least one vacuum port in its surface and means to valve said vacuum to said pick-up means and high speed disc, whereby papers are transferred from said pick-up means to said high speed disc.

7. In apparatus for handling papers and the like, at least one wheel having a port in its surface, a source of vacuum, means to valve said vacuum comprising a pivoted valve member mounted on the side of said wheel,

7

said member adapted to connect said port to said source of vacuum, and external control means adapted to move said member as said wheel is rotated.

8. Apparatus as in claim 7 wherein said control means is a pin mounted adjacent said wheel.

9. Apparatus as in claim 5 for feeding papers or the like from a stack having means to pull back the bottom paper of said stack comprising an oscillatable member having a port therein adapted to contact the bottom paper of said stack, a source of vacuum connected to said port, and means to oscillate said oscillatable member.

10. Apparatus as in claim 9 wherein the vacuum to said port is valved.

11. Means to handle papers comprising a first rotatable disc having at least one port on its surface, a second rotatable disc having at least one port on its surface, said second disc being mounted beside and coaxial with said

8

first disc, a source of vacuum connected to said ports to hold papers, means to drive said discs at different speeds, and means to valve said vacuum to transfer papers from one of said discs to the other.

References Cited in the file of this patent

UNITED STATES PATENTS

667,822	Goebel	Feb. 12, 1901
1,681,413	Kronqvist	Aug. 21, 1928
1,707,209	Broadmeyer	Mar. 26, 1929
1,774,315	Broadmeyer	Aug. 26, 1930
1,986,671	Barkley	Jan. 1, 1935
2,033,849	Mudd	Mar. 10, 1936
2,394,007	Paynter	Feb. 5, 1946
2,524,417	Bamber	Oct. 3, 1950
2,704,209	Halahan et al.	Mar. 15, 1955