March 9, 1965 J. W. LENK 3,172,655

MECHANISM FOR REMOVING BLANKS OR SHEETS FROM A STACK

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Fig. 1.

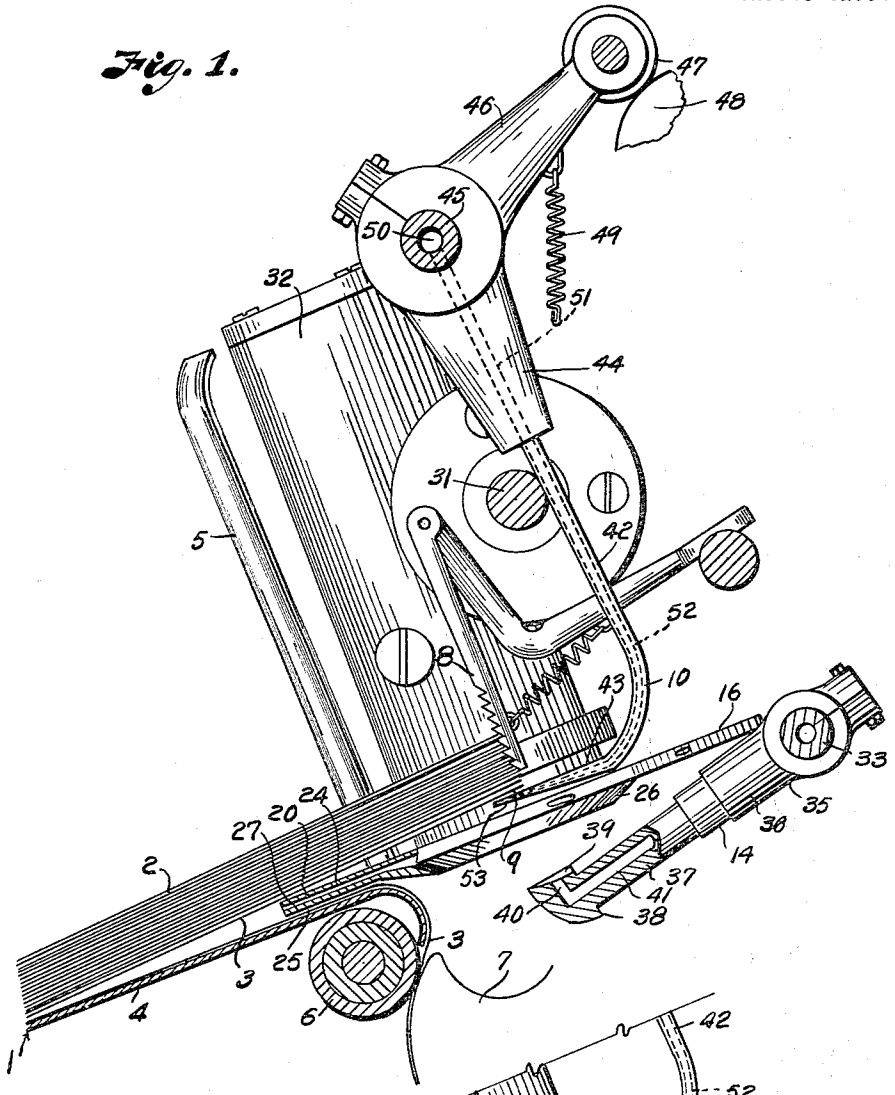
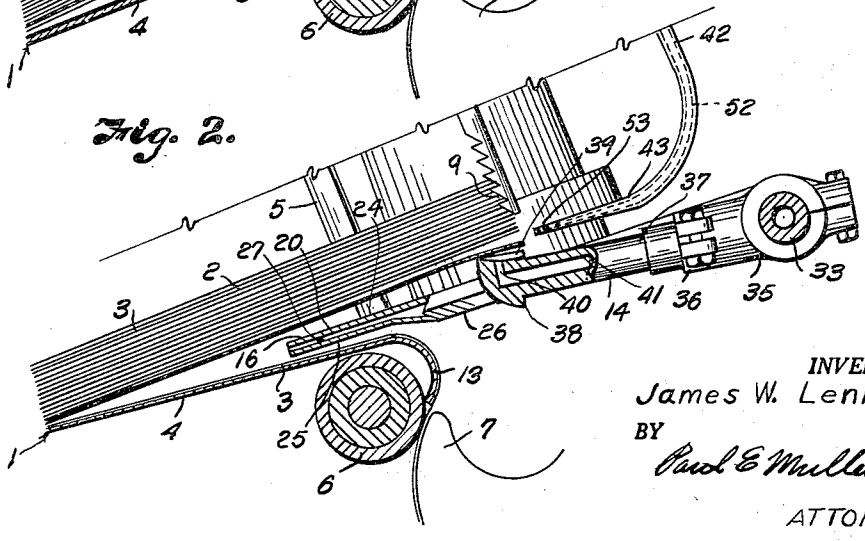



Fig. 2.




INVENTOR.
James W. Lenk
BY
Paul E. Mullendore
ATTORNEY

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Fig. 3.

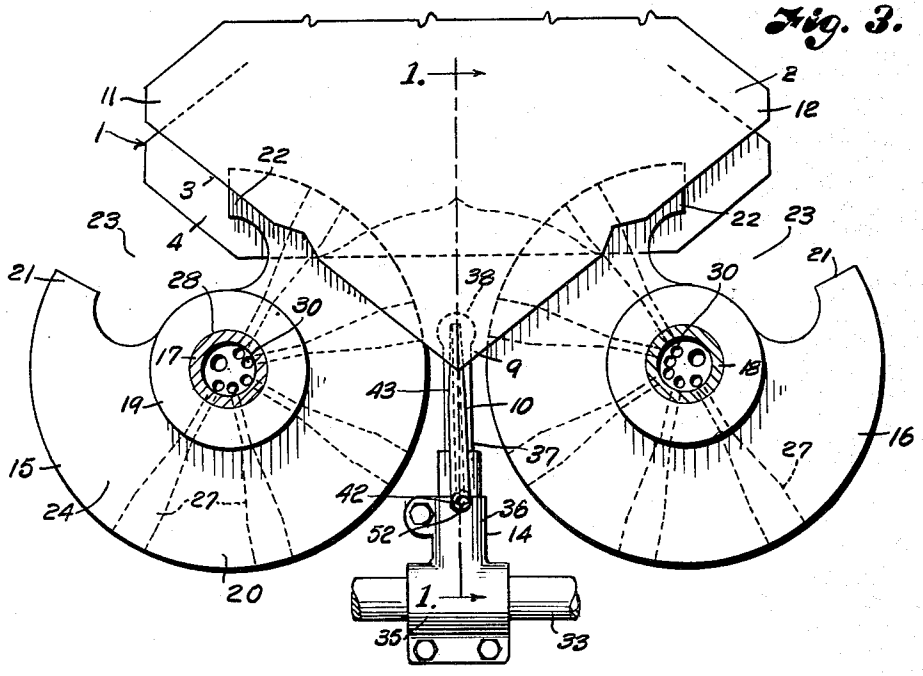



Fig. 6.

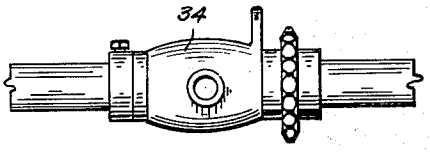



Fig. 5.

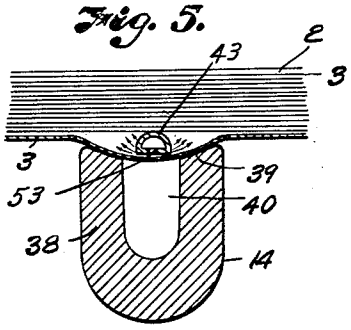



Fig. 7.

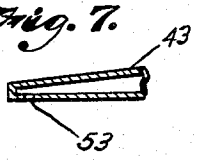
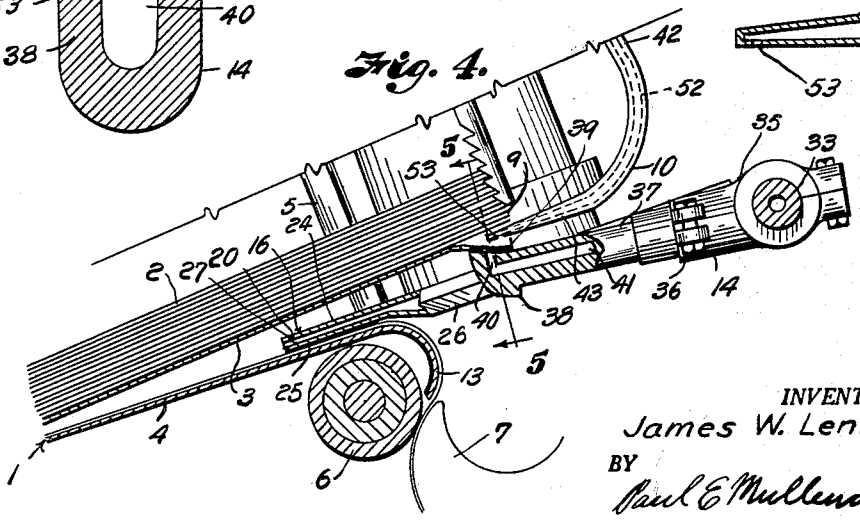



Fig. 4.




INVENTOR.
James W. Lenk
BY
Paul E. Mullendore
ATTORNEY

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# 3,172,655
# MECHANISM FOR REMOVING BLANKS OR SHEETS FROM A STACK

James W. Lenk, Shawnee Mission, Kans., assignor to Berkley Machine Company, Kansas City, Mo., a corporation of Missouri

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2 Claims. (Cl. 271—2)

This invention relates to machines for processing, printing, and/or making envelopes and similar articles from blanks or sheets, and more particularly to a mechanism for removing the blanks or sheets in consecutive order from a stack.

It is the present practice to supply such machines from a stack of blanks and to remove the blanks from the stack by a pair of counter-rotating disks having recesses in the periphery thereof through which a leading portion of a withdrawn blank is drawn by an oscillatable suction nozzle that operates in timed relation with rotation of the disks. The suction nozzle swings into contact with the blank while the blank is in the stack and suction is effective through the nozzle to draw the contacted portion of the blank into a recess of the nozzle to open space into which a separator moves to hold back the next blank in the stack while the seized blank is being drawn by the nozzle into the rotating disks. Such apparatus operates in a satisfactory manner at certain speeds, but at higher speeds and with certain grades of sheet material, the blank is not properly seized by the nozzle and the nozzle retracts without carrying the blank therewith. This results in a mis-feed and probable damage to the edge of the blanks by the separator.

It is, therefore, a principal object of the present invention to provide means for assuring a positive seizure of the blank by the vacuum suction and at the same time assure proper engagement of the separator with the stack for holding back the following blank.

A further object of the invention is to provide the separator with jet means for discharging a jet of air to force the lowermost blank into the recess of the suction nozzle and hold the position thereof under pressure to give the suction time for gripping the blank before the nozzle begins its swing away from the stack.

In accomplishing these and other objects of the invention as hereinafter described, an improved mechanism is provided, the preferred form of which is illustrated in the accompanying drawings, wherein:

FIG. 1 is a vertical central section through a mechanism for removing blanks from a stack into a processing machine, the section being taken on the line 1—1 of FIG. 3 and showing the separator engaging the stack just prior to withdrawal thereof and the vacuum nozzle moving into contact with the stack.

FIG. 2 is a similar view of the lower portion of the mechanism, showing the suction nozzle pulling down the bottom blank of the stack and the separator moving into position to support the next blank in the stack and prior to the discharge of a jet therefrom which provides the pressure for seating the blank tightly in the recess of the nozzle.

FIG. 3 is a horizontal section through the stack, particularly illustrating the disks on the respective sides of the suction nozzle and separator.

FIG. 4 is a section similar to FIG. 2, but showing the nozzle ready to move away from the stack to carry the blank therewith.

FIG. 5 is an enlarged cross section through the suction nozzle, showing the recess therein and the lowermost blank pressed thereinto by the jet from the separator, the section being taken on the line 5—5 of FIG. 4.

FIG. 6 is a fragmentary view of one of the valves for controlling suction to the suction nozzle or air under pressure to the separator, as the case may be.



FIG. 7 is an enlarged fragmentary section through the tongue of the separator, to better illustrate the jet opening.

Referring more in detail to the drawings:

1 designates a support carrying a stack 2 of blanks 3 such as are used in an envelope making machine. The stack support 1 includes a flat table 4 and vertical guides 5 that engage the sides of the stack to retain the blanks on the table 4 in position to be withdrawn into the envelope making machine, represented by indrawing rotors 6 and 7. 8 is a toothed bar for supporting the leading side of the stack above the table 4, as best shown in FIG. 1. The blanks 3 are positioned in the stack 2 with corner portions 9 thereof that form one of the transverse flaps of an envelope projecting from the table 4, with the point portions of the lowermost blanks supported by a separator 10, while the point portions of the upper blanks are carried by the teeth of the bar 8 to reduce pressure of the stack on the lowermost blanks. The immediately adjacent corners 11 and 12 of the blank are carried by the stack support so that they are retained in substantially the plane of the corner portions 9. The table 4 has a downwardly curved forward edge portion 13 over which the blanks are withdrawn by the rotors 6 and 7 into the envelope making machine.

In removing the lowermost blank from the stack, the marginal edge of the projecting portion, which in the illustrated instance is the corner 9, is engaged by a suction nozzle 14 that moves upwardly into contact with the under face of the corner 9 to seize the corner portion of the lowermost blank, responsive to suction within the nozzle, and draw it downwardly for engagement by the rotors 6 and 7. Spaced apart separating disks 15 and 16 are provided to facilitate withdrawal of the blank from under the stack. The disks 15 and 16 are rotatable in planes substantially parallel with the table 4 on tubular shafts 17 and 18 (FIG. 3). The disks 15 and 16 are of like construction and located in laterally spaced apart relation to permit movement of the suction nozzle 14 therebetween. Each disk includes a hub 19 (FIG. 3) having an outwardly extending arcuate blade portion 20 which is sufficiently thin to enter the space between the bottom of the lowermost blank and the table 4. The ends of the arcuate blade portion 20 terminate in tongues 21 and 22 (FIG. 3) on opposite sides of a recess 23 to provide a throat or passageway through which the corner 9 of the lowermost blank is withdrawn by the suction nozzle 14, as later described.

The arcuate blade portions 20 of the disks have substantially flat upper faces 24 and correspondingly flat lower faces 25 that encircle a depending central portion 26 connecting a plurality of radial passageways 27 discharging through the peripheries of the disks. The hubs 19 of the disks have bores or axial recesses 28 (FIG. 3) which terminate substantially in plane with the upper faces 24 of the blade portions of the disks, and the bottoms thereof are provided with ports 30 that connect with the radial passageways 27. The separating disks 15 and 16 are carried on the ends of the tubular shafts 17 through which air under pressure is discharged to the radial passageways 27. The separating disks 15 and 16 are actuated by means of a counter shaft 31 that is connected with the shafts 17 and 18 through connecting gears, not shown but contained in the housing 32 shown in FIG. 1.

The apparatus thus far described, including the suction nozzle and separator, operates successfully on certain types of paper stock and at relatively low speeds. However, when other types of envelope stock are used and the envelope making machine is operated at higher

speeds to increase the output thereof, the suction through the suction nozzle **14** does not always seize a blank, with the result that the blank slips off the suction nozzle and a miss occurs, leaving a blank space in the travel of envelope blanks through the envelope making machine.

The present invention is to provide means to assure engagement of a blank by the suction nozzle **14** each time it moves into contact with the bottom blank of the stack. Therefore, when the suction nozzle swings away from the stack, a blank is carried through the throat of the separating disks and into position to be engaged by the indrawing rollers of the envelope making machine, as now to be described.

In carrying out the present invention, the suction nozzle **14** is fixed to a transverse oscillatory shaft **33**, having an axial port through which vacuum is drawn under control of a valve **34** of the type illustrated in FIG. 5. The nozzle **14** includes a clamp member **35** that is clamped to the shaft **33** and which has a laterally directed tubular socket **36** adjustably carrying a tubular shank **37** having a head **38** on the outer end thereof. The head **38** has a transversely concaved recess **39** in the upper face thereof, and located in the bottom of the recess is a suction port **40** that is connected with the axial channel of the oscillatory shaft **33** by means of a passageway **41**.

The separator **10** includes a shank **42** terminating in a laterally directed tongue **43**. The shank **17** is carried by an arm **44** fixed on a rock shaft **45** located above the counter shaft **31** (see FIG. 1). Fixed to the rock shaft **45** is an arm **46** having a roller **47** journaled on the outer end thereof for engaging a cam **48** to rock the shaft in one direction to swing the tongue of the separator into position to engage the under side of the stack, as shown in FIG. 1. The arm is moved in the opposite direction as the roller moves along the low lobe portion of the cam by a spring **49** having one end fixed to the arm and its other end engaging a fixed part of the mechanism, not shown. The lateral tongue **43** of the separator is carried by the rock shaft **45** and reciprocates directly over and in plane with the path of the suction nozzle head for movement into the recess **39** when the suction head is engaging the lowermost blank to support the next upper blank after the suction head carries the projecting portion of the lowermost blank into the blank withdrawing means.

In carrying out the present invention, the rock shaft **45** has an axial bore **50** that connects with a bore **51** in the arm **44**, which in turn connects with a passageway **52** that extends through the shank and the lateral tongue thereof, as shown by the dotted lines in FIG. 1. The passageway **52** terminates in the end of the tongue and is provided with a downwardly facing port **53** for periodically discharging air under pressure under control of a valve of the type illustrtaed in FIG. 5 and located on the rock shaft, the specific construction of which forms no part of the present invention.

Assuming that the apparatus is constructed and assembled as described and that a stack of blanks is supported on the table **4** and by the teeth of the bar **8**:

With the separator disks rotating in counter directions, the recesses **23** thereof begin to register in facing relation at the time the suction nozzle swings upwardly between the disks to engage the underneath face of the lowermost blank in the stack. With movement of the suction nozzle in this position, the tongue of the separator is retracted to permit the suction through the nozzle to draw the tip portion **9** of the lowermost blank into the recess **39** of the nozzle head to open up a space below the next uppermost blank, so that when the separator tongue swings into engagement with the stack, it will enter the space above the lowermost blank. The envelope stock may have certain characteristics so that the blank, on downward movement of the suction nozzle, slips off the head **38**, but to avoid this difficulty air under pressure is discharged from the opening **53** against the blank to force the blank into the recess, thereby forcing the tip of the blank into positive engagement with the bottom surface of the recess in the suction nozzle. Therefore, with full engagement of the vacuum, the port **40** is sealed around the sides thereof by the blank, so that the suction is effective in carrying the blank with the nozzle through the throat formed by the recesses **23** in the separating disks. Further movement of the nozzle carries the tip of the blank into position to be engaged by the rotor **7** to feed it into the envelope making machine.

Upon release of the vacuum in the suction nozzle, the suction nozzle swings upwardly toward its engagement with the stack and the tongue of the separator is withdrawn, to complete one cycle of operation. The next blank is engaged in similar manner upon each cycle of operation, so that the blanks are fed consecutively from the stack into the envelope making machine without missing a blank.

What I claim and desire to secure by Letters Patent is:

1. In an apparatus for removing envelope blanks in consecutive order from the bottom of a stack of said blanks,

means supporting the stack of blanks with the face of one blank bearing upon the face of the next lower blank with a portion of the stack projecting beyond said supporting means,

means below the projecting portion of the stack for withdrawing the blanks from the bottom of the stack,

a suction nozzle having a head provided with a recess having a transversely concaved bottom and having a suction port in said bottom of the recess,

means supporting the suction nozzle for swinging movement on a horizontally transverse axis to bring the concave face of said nozzle into contact with a margin of the projecting portion of the lowermost blank to cup said margin into said recess responsive to suction through the suction port for opening up a space between said margin of the lowermost blank and the margin of the next upper blank in the stack and for gripping said lowermost blank to carry the projecting portion of the lowermost blank downwardly from the bottom of the stack to the blank withdrawal means when the suction nozzle swings away from the stack,

a blank separator having a laterally projecting tongue provided with a downwardly directed jet opening near the end portion of said tongue for discharging a downwardly directed air jet, and

means supporting the blank separator for reciprocation directly over and in plane with the path of the suction nozzle head and for movement of said tongue into the space between the portion of the lowermost blank cupped into the concave face of the nozzle head and the next upper blank to cause the downwardly directed jet to seat the cupped portion of the blank positively against the concaved bottom of the recess in the nozzle head as the tongue moves into position under the margin of said next upper blank to support the projecting portion of the stack when the suction nozzle carries the projecting portion of the lowermost blank into the blank withdrawing means.

2. In an apparatus for removing envelope blanks in consecutive order from the bottom of a stack of said blanks,

means supporting the stack of blanks with the face of one blank bearing upon the face of the next lower blank with a corner portion of the stack projecting beyond said supporting means,

spaced apart separating disks rotatable below the projecting portion of the stack and providing an open throat therebetween on each revolution of said separating disks,

means below the separating disks for withdrawing the blanks from the bottom of the stack,

a suction nozzle having a head provided with a transversely concaved recess in the upper face of said head and having a suction port in the bottom of the recess.

means supporting the suction nozzle for swinging movement through said throat of the separating disks on a horizontally transverse axis to bring the head of said nozzle into contact with the projecting corner portion of the lowermost blank to cup said corner portion into said recess responsive to suction through the suction port for opening up a space between said corner portion of said lowermost blank and the corner portion of the next upper blank in the stack and for gripping said lowermost blank to carry said corner portion of the lowermost blank downwardly through said throat to the blank withdrawal means on downward movement of the suction nozzle,

a blank separator having a laterally projecting tongue provided with a jet opening in the end portion of said tongue for discharging an air jet, and

means supporting the blank separator for reciprocation directly over and in plane with the path of the nozzle head and for movement of said tongue into said space between the corner portion of the lowermost blank that is cupped into the concaved recess of the nozzle head and the corner portion of the next upper blank whereby said jet presses the cupped corner portion of the blank positively against the bottom of the concaved recess in the nozzle head as the tongue moves under the projecting corner portion of said next upper blank to support said projecting corner portion of said next upper blank when the suction nozzle carries the projecting corner portion of the lowermost blank through the throat of the separating disks into the blank withdrawing means.



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