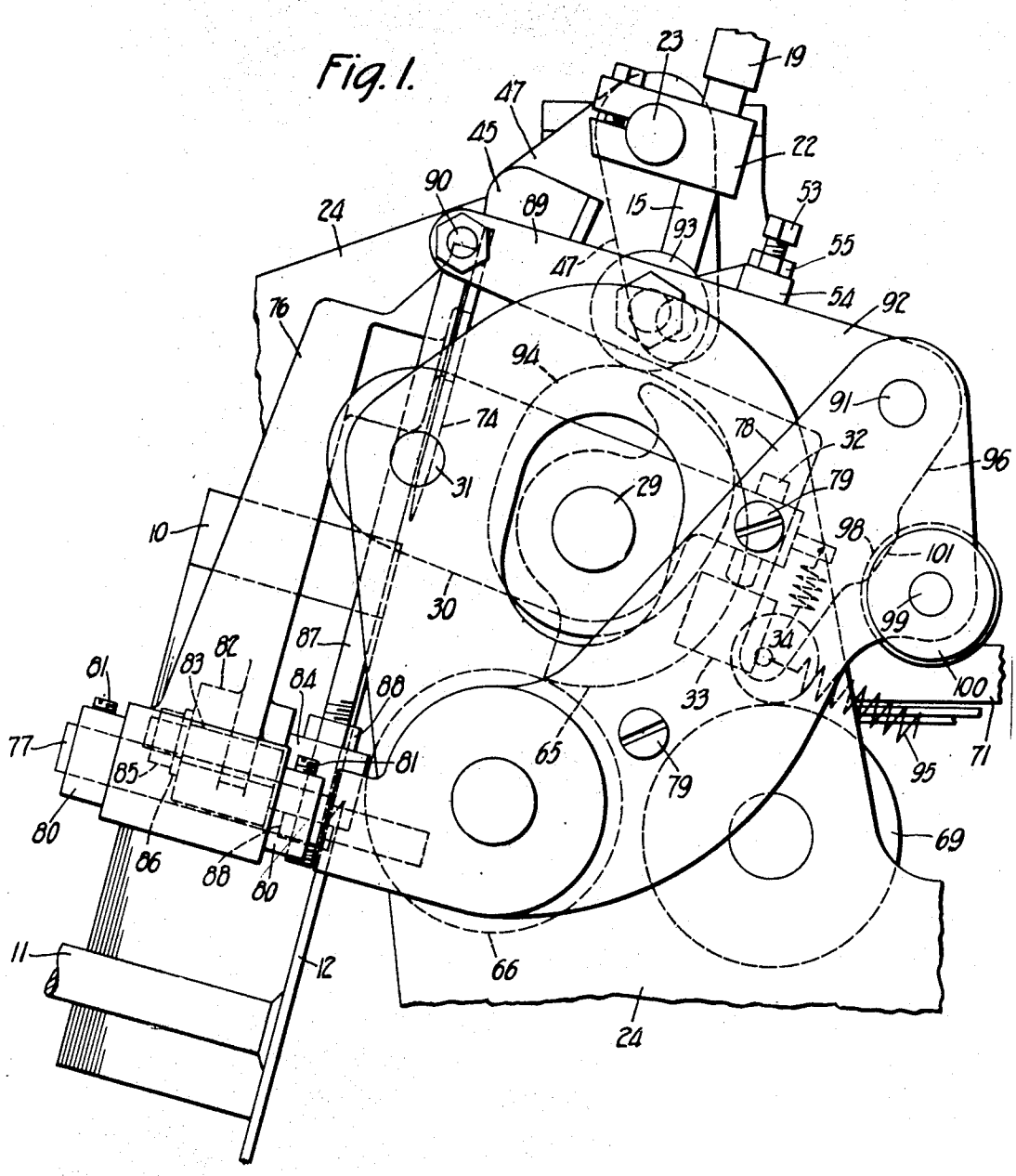
April 6, 1943. A. NOVICK 2,315,646

SHEET FEEDING APPARATUS

Filed Jan. 21, 1941 4 Sheets-Sheet 1

Fig. 1.



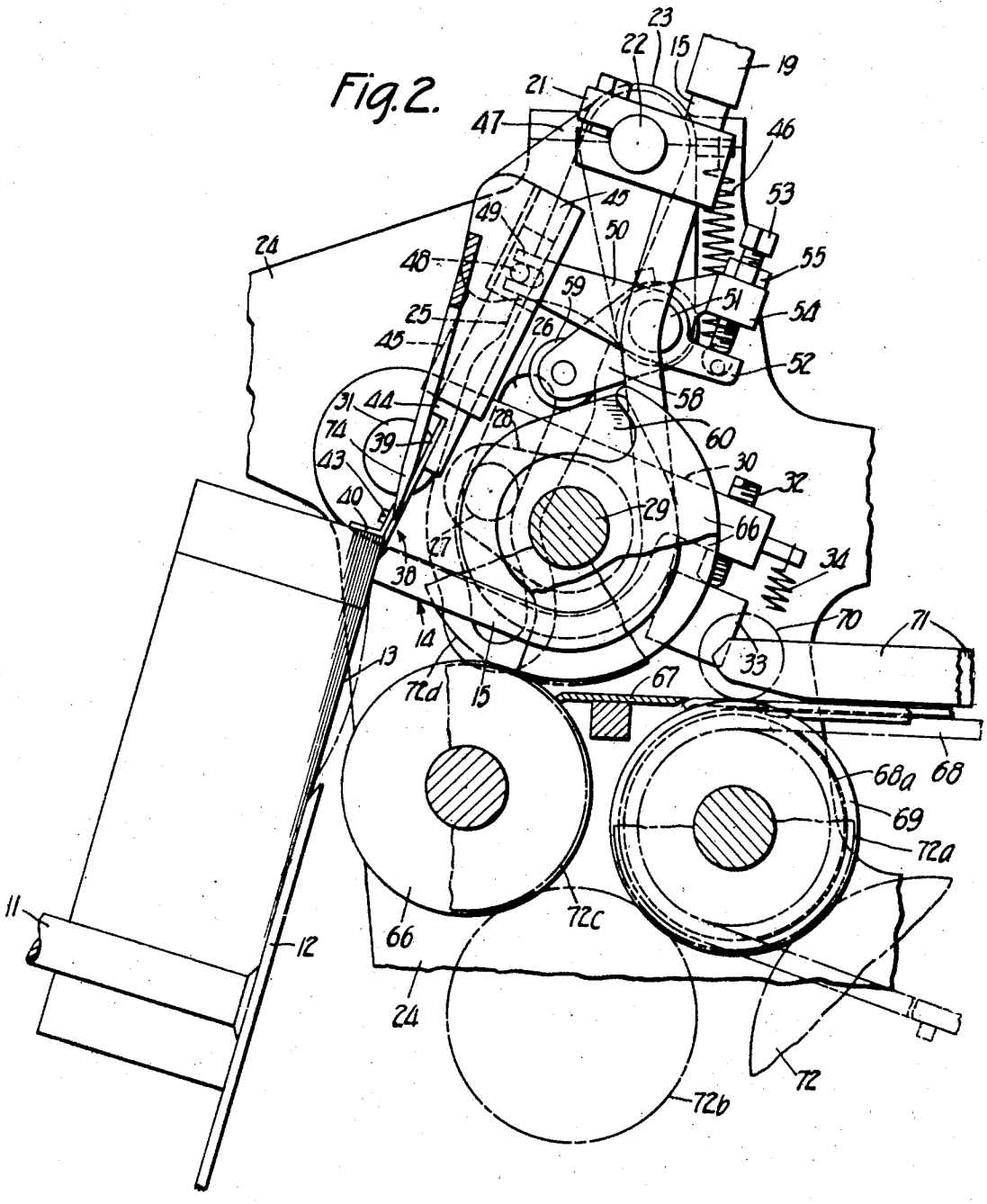
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SHEET FEEDING APPARATUS

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Fig. 2.



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SHEET FEEDING APPARATUS

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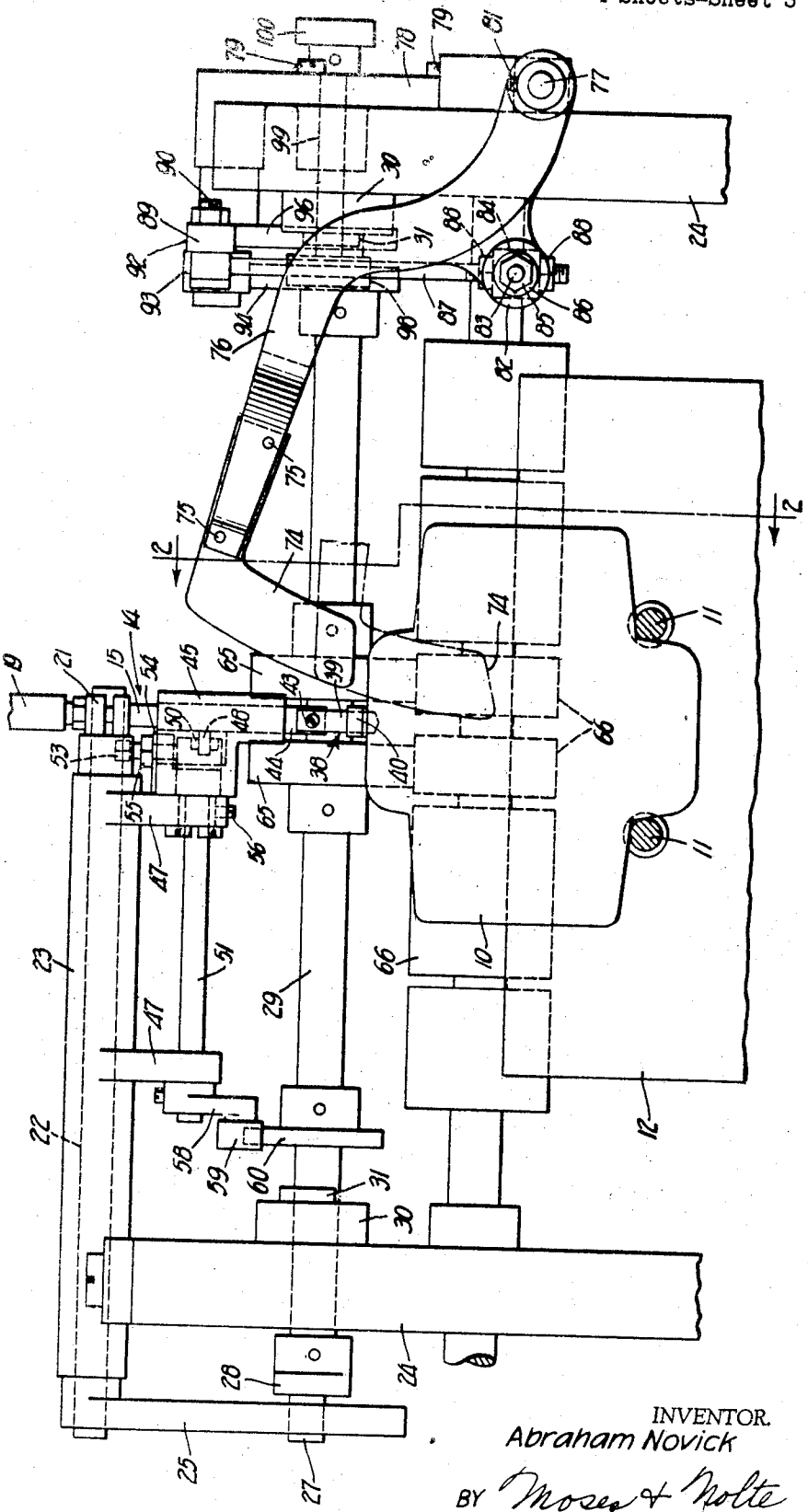


Fig. 3.

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SHEET FEEDING APPARATUS

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Fig. 4.

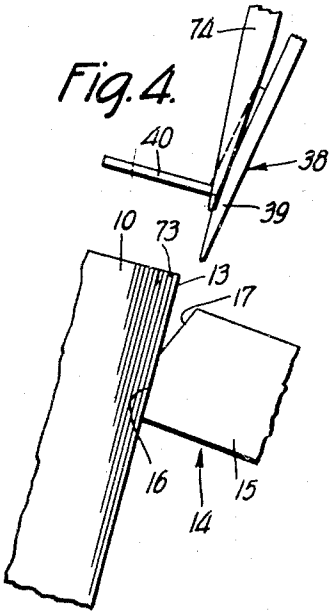


Fig. 5.

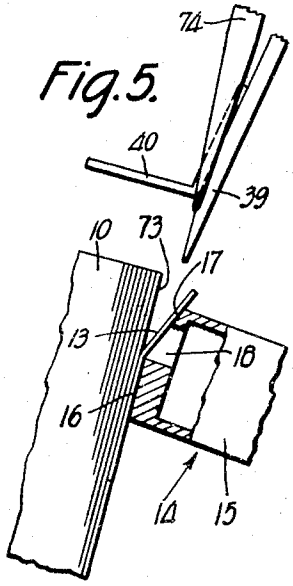


Fig. 6.

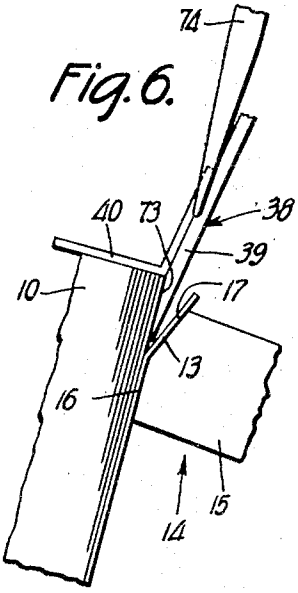


Fig. 7.

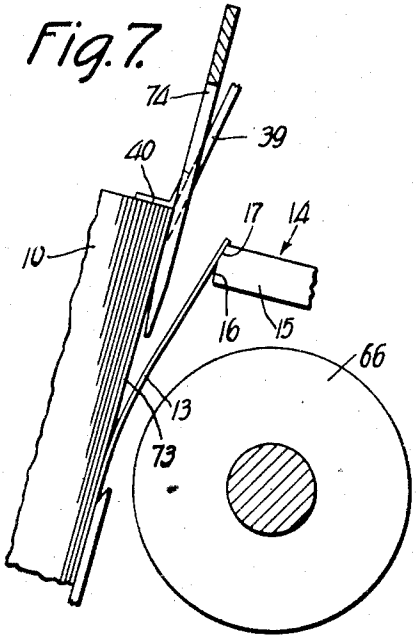
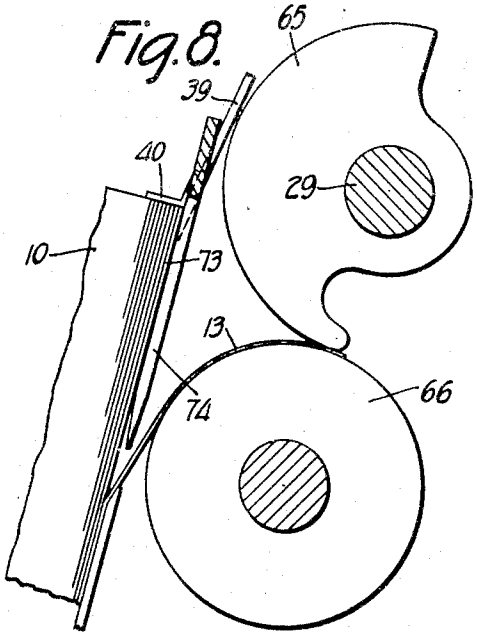


Fig. 8.



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UNITED STATES PATENT OFFICE

2,315,646

SHEET FEEDING APPARATUS

Abraham Novick, Flushing, N. Y., assignor to F. L. Smithe Machine Co., Inc., New York, N. Y., a corporation of New York

Application January 21, 1941, Serial No. 375,227

18 Claims. (Cl. 271—29)

This invention relates to improvements in sheet feeding mechanism and especially to an arrangement for feeding sheets from the bottom of a stack without disarrangement of adjacent sheets.

The invention is particularly applicable to sheet feeding mechanism of the type in which the stack of sheets rests on a support extending only partly across the bottom of the stack, leaving a marginal portion of the bottom sheet free for deflection from the second sheet, engagement by suitable gripping means and withdrawal from the stack. During such withdrawal the second sheet and the adjacent part of the stack may be held in place by a retaining device engaging the edge or corner of the stack and extending along the otherwise unsupported edges of the lower sheets, thereby facilitating the withdrawal of the bottom sheet while preventing the superposed sheets from shifting endwise.

It has been found, however, that with certain types of sheet material and of sheet-withdrawing mechanism the portion of the second sheet in register with the bottom support has a tendency to shift with the bottom sheet as the latter is withdrawn, thereby causing the free portion of the second sheet to buckle between the end of the bottom support and the retaining device at the stack edge, and to project from the stack when such retaining device is withdrawn, thereby interfering with the operation of the feeding mechanism.

The principal purpose of this invention is to provide means for preventing the second sheet from shifting endwise when the bottom sheet is withdrawn. This is in general accomplished by providing retaining means bearing against such unsupported portion of the second sheet during withdrawal of the bottom sheet, arranged to keep the second sheet from buckling and thereby to prevent the endwise shifting of the second sheet.

Since it is necessary to locate a substantial number of devices and members immediately adjacent the unsupported portion of the bottom sheet, such as means for initially deflecting the edge of said sheet, means for thereafter bending the free portion of such sheet away from the second sheet, means for gripping said portion and withdrawing the sheet from the stack, and retaining means engaging the free edge of the stack, the introduction of an additional device arranged to engage said free portion of the second sheet presents serious mechanical problems of construction and arrangement, the solution of which is a feature of the invention. Specifically, the means for holding the second sheet against buckling and endwise shifting is advantageously provided in the form of a thin, flat member positioned and shifted in a plane generally parallel to the sheets in the stack, whereby the member may be shifted into and out of operative position in minimum space and without interfering with adjacent portions of the apparatus.

A further feature is the provision of a device of the indicated type which may be readily incorporated in and attached to existing sheet feeding apparatus.

Other objects and advantages of the invention will appear from the following description considered in conjunction with the accompanying drawings, in which—

Fig. 1 is a side elevational view of a sheet feeding apparatus embodying the invention;

Fig. 2 is a transverse vertical sectional view through said apparatus on line 2—2 of Fig. 3;

Fig. 3 is a front elevational view of said apparatus in a direction normal to the sheets in the stack; and

Figs. 4 to 8 are diagrammatic side elevational views of successive stages in the separation and withdrawal of the bottom sheet and the retention of the second sheet in position on the stack.

The specific embodiment of the invention disclosed herein constitutes a sheet feeding mechanism which may be employed in connection with various types of apparatus, such as envelope making machines, and is adapted to be actuated by the usual drive mechanism of such machines. It may be employed, for instance, in the construction illustrated in my application Serial No. 327,967, filed April 5, 1940, for Sheet feeding mechanism.

In the present embodiment the stack 10 of sheets, such as envelope blanks, is engaged at one edge by support rods 11 fitting in the angles formed at the junctions of the side flaps with the sealing flaps of the envelope blanks. The lower end of the stack rests against the table 12 which extends only partially across the bottom of the stack, advantageously engaging about the lower half of the bottom blank 13. Rods 11 and table 12 are tilted slightly so that the stack 10 bears against the table 12 and the lowermost sheet 13 is maintained in contact with said table.

The upper free portion of the bottom sheet 13 is deflected and brought into position for engagement by the withdrawing mechanism by means of suction picker 14, comprising a metal tube 15 having its lower end position curved toward the stack and terminating in a flat face 16 (Fig. 5) arranged to bear against the bottom sheet 13, and a face 17 inclined away from the bottom sheet and provided with a suction opening 18. The upper end of tube 15 is connected through flexible hose 19 to a suitable source of suction through appropriate valve mechanism of standard type arranged to place the picker alternately in communication with a source of suction and with the atmosphere at appropriate points in the operating cycle.

Tube 15 is mounted through clamp block 21 on rock shaft 22 journaled in the elongated bearing bracket 23 mounted on the frame 24, shaft 22 carrying at its opposite end rock arm 25 provided with a slot 26 engaged by crank pin 27 on crank 28 fixed to shaft 29 journaled in the outer ends of rock arms 30, the inner ends of which are pivotally mounted on studs 31 on the frame 24. The outer end of each rock arm 30 carries an adjusting screw 32 bearing on an abutment 33 on the frame 24, and is biased downwardly by spring 34, thereby maintaining shaft 24 in adjustable upwardly yielding position.

A stack retaining device 38 engaging the corner or edge of the stack at the free margin of the bottom sheet 13 may be provided for controlling the upper margins of the blanks at the delivery end of the stack when the picker 14 is not in engagement with the stack, it being understood that under certain conditions retainer 38 may be dispensed with, and a sheet separator of the usual type may be employed. The retaining device 38 comprises a finger or blade 39 arranged to extend along the marginal portion of the exposed lower face of the end sheet or blank 13, and a hold-down finger or plate having a sheet-engaging section 40 adapted to bear against the upper edges of the blanks in stack 10 adjacent the bottom blank 13, and a slide section 42 held in suitable adjusted position by clamp screw 43 threaded into blade 39.

Suitable means is provided for shifting the stack retaining device 38 into and out of operative position. In the form illustrated blade 39 is fixed to a square slide bar 44 slidable in a guideway in bracket 45 fixed to a hanger 47 on bearing bracket 23. Drive pin 48 on bar 44 is engaged by fork 49 on rock arm 50 fixed on rock shaft 51 journaled in hangers 47 and carrying a rock arm 58 provided with a roller 59 engaging cam 60 on shaft 29. Arm 50 includes a tail piece 52 (Fig. 2) biased upwardly by spring 46 and engaging stop screw 53, threaded through stop arm 54 on bracket 47 and locked in adjusted position by nut 55. With this arrangement the lowermost position of arm 44 can be adjusted by turning screw 53.

Suitable means is provided for gripping the upper portion of the bottom blank 13, withdrawing said blank from the stack 10 and advancing it to a conveyor or operating device, the nature of which is not involved in this invention. The arrangement illustrated includes two feed segments 65 fixed on shaft 29 at either side of the stack retaining device 38, and cooperating feed rolls 66. Blanks advanced by segments 65 and feed rolls 66 travel over a table 67 and are fed by rollers 69 and 70 onto chain belts 68 guided by sprockets 68*a*, the blanks being held against the belts by the presser roll 70 and hold-down bars 71. Feed rolls 66 and 69, as well as shaft 29 carrying feed segments 65, are driven in appropriate directions by suitable drive means including gears 72, 72*a*, 72*b*, 72*c* and 72*d*.

A second sheet retaining device is mounted on the feeding apparatus, arranged and actuated to bear against the portion of the second blank 73 located between the upper edge of the table 12 and the stack retaining device 38 during withdrawal of the bottom blank 13 (Fig. 8) to prevent shifting and buckling of the second blank 73, and is retracted after withdrawal of the bottom blank to permit the necessary engagement by the picker 14 with such second blank which has now become the bottom blank. This is advantageously accomplished by employing a flat plate or blade 74, generally termed a shovel, located at one side of the stack 10 during deflection of the upper end of the bottom sheet 13 and shifted downwardly along the rear face of the second sheet 73 into appropriate position before withdrawal of the bottom sheet 13 commences. The width of shovel 74 is substantially less than the width of second sheet 73, and advantageously is less than half the width of said sheet.

Suitable mechanism for thus actuating shovel 74 is provided. In the form illustrated shovel 74 is attached as by rivets 75 (Fig. 3) to shovel arm 76 pivoted on stud 77 fixed in frame member 78 removably mounted on frame 24 as by screws 79 (Fig. 1). Adjustable collars 80 engaging opposite sides of shovel arm 76 are adjustably fixed to stud 77 by set screws 81, permitting transverse adjustment of the position of the shovel 74 relative to the bottom of stack 10.

Appropriate mechanism is provided for oscillating shovel arm 76 about stud 77 in synchronism with the feeding mechanism. In the form shown shovel arm 76 is provided with an extension 82 (Figs. 1 and 3) in which pivot stud 83 is journaled, said stud being mounted on link block 84, extension 82 being held on the stud by nut 85 threaded on stud 83 and engaging washer 86 bearing against a suitable shoulder on said stud.

One end of link rod 87 passes through a suitable bore in block 84 and is adjustably held in position by nuts 88 threaded on rod 87 and bearing against opposite sides of block 84. The other end of link rod 87 is pivoted to the forward end of bell crank 89 by means of bolt 90. Bell crank 89 is pivotally mounted on frame member 78 through pivot stud 91, and upper arm 92 of said crank is provided with a roller 93 bearing against cam 94 on shaft 29. Coil spring 95 attached to depending crank arm 96 and to the frame 24 is suitably arranged to urge roller 93 and cam 94 into engagement.

A suitable arrangement is provided for holding shovel 74 out of operative position during operation of the sheet feeding mechanism, this being desirable when the envelope blanks are small or when the material of the blanks is sufficiently thick to give them a fair degree of stiffness. In the embodiment disclosed, this arrangement comprises a hold-out disc 98 on rod 99 slidably mounted in frame member 78 and carrying knob 100. During normal operation of shovel 74, knob 100 rests against member 78 and hold-out disc 98 is out of register with depending arm 96 of bell crank 89, advantageously overlapping said arm to prevent accidental movement of the disc which might inadvertently interfere with the operation of shovel 74. When it is desired to hold shovel 74 out of operation, the latter is manually raised until the projection 101 (Fig. 1) on arm 92 clears the path of disc 98, whereupon disc 98 may be shifted into alignment with arm 92 by drawing knob 100 away from member 78, maintaining shovel 74 in inactive position by engagement between projection 101 and disc 98. Shovel 74 may be returned to operation at any time by pressing knob 100 inwardly against frame member 78.

The operation of the apparatus is indicated diagrammatically in Figs. 4 to 8. At the beginning of the cycle the stack retaining device 38 and shovel 74 are in upper position clear of stack 10 (Fig. 4). Suction picker 14 is swung forward by crank pin 27 until face 16 bears against the

bottom blank 13 immediately below the upper edge thereof. Suction is then applied through hose 19 and is effective through suction opening 18, of tube 15, to draw the upper margin of blank 13 against the inclined face 17 of the suction picker (Fig. 5) while holding the main part of the blank 13 against deflection by means of face 16. The stack retaining device 38 then moves downwardly, blade 39 approaching the upper margin of the second blank 73 at an angle owing to the inclined position of slide bar 34 relative to the said blank, thereby assuring engagement with the lower face of blank 73 despite any tendency of said blank to be deflected slightly owing to curling or any other cause. When the retaining device 38 has reached its lowermost position (Fig. 6) blade 39 will bear against the upper margin of the rear face of second blank 73, and hold-down plate 40 will bear against the upper margins of adjacent sheets of the stack, thereby holding the upper corner or edge of the stack 10 in accurate registered position and restraining the lowermost sheets of said stack against edgewise movement.

Suction picker 14 is then swung away from stack 10, separating from the second blank 73 the upper free portion of the bottom blank 13 projecting beyond table 12 (Fig. 7), and carrying said portion partly around feed roll 66, where its upper margin is grasped by the advance portions of feed segments 65 (Fig. 8). During this retrograde movement of the picker 14, shovel 74 is moved downwardly by the action of cam 94, descending along the rear face of second sheet 73 until the shovel reaches a position close to the upper margin of table 12 not later than the stage when blank 13 is gripped between segment 65 and rolls 66 and withdrawal of the lower portion of blank 13 from its position between blank 73 and table 12 commences. During such withdrawal shovel 74 holds blank 73 flat against the stack and effectively prevents buckling or endwise motion of said blank in the zone between table 12 and device 38 in which buckling might otherwise take place. The advance edge of blank 13 is fed by segment 65 and rolls 66 to any suitable conveying or processing mechanism, and in the illustrated construction travels over table 67 and between feed roll 69 and presser roll 70 onto belts 68.

While the end of the stack from which the sheets are withdrawn has been termed the bottom of the stack for convenience of description, this is not intended to be restrictive, since the invention is not necessarily limited to apparatus in which the sheets are fed from the lowermost end of the stack.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. Sheet feeding apparatus comprising means for fully supporting a stack of sheets, means for deflecting a marginal portion of the bottom sheet and withdrawing said sheet by engagement with said portion, and means independent of the supporting means and movable into engagement with the second sheet, after deflection of the bottom sheet but prior to withdrawal thereof, for preventing buckling of the second sheet during such withdrawal.

2. Sheet feeding apparatus as set forth in claim 1 in which the means for preventing buckling of the second sheet comprises means engaging the margin of the second sheet adjacent the deflected portion of the bottom sheet, and separate means extending along the bottom face of the second sheet adjacent the center of the sheet.

3. Sheet feeding apparatus comprising means for fully supporting a stack of sheets including a bottom support extending only partly across the bottom of the stack, leaving a substantial portion of the bottom sheet free from said support; means for engaging said free portion of the bottom sheet and withdrawing said sheet from the stack; and means for preventing disarrangement of adjacent sheets by such withdrawal, comprising means independent of the supporting means and engaging the bottom face of the second sheet substantially from the bottom support to the opposite free edge of said second sheet during withdrawal of the bottom sheet, arranged to prevent buckling of the free portion of the second sheet during withdrawal of the bottom sheet.

4. Sheet feeding apparatus comprising means for fully supporting a stack of sheets including a bottom support extending only partly across the bottom of the stack leaving a substantial portion of the bottom sheet free from said support; means engaging said free portion of the bottom sheet and withdrawing said sheet from the stack, comprising means for downwardly deflecting a margin of the free portion of the bottom sheet and means engaging the deflected portion and withdrawing said sheet; and means for preventing disarrangement of adjacent sheets by such withdrawal, comprising anti-buckling means independent of the supporting means and bearing against the bottom face of the second sheet substantially from the bottom support to the opposite free edge of the second sheet, and means for shifting the anti-buckling means into operative position while the free position of the bottom sheet is in deflected position and prior to the commencement of withdrawal of said bottom sheet.

5. Sheet feeding apparatus as set forth in claim 4 in which the anti-buckling means includes a flat sheet-engaging member movable into and out of operative position in a direction substantially parallel to the sheets in the stack.

6. Sheet feeding apparatus comprising means for supporting a stack of sheets with a marginal portion of the bottom free from the support, means for withdrawing the bottom sheet, and means for preventing buckling of the second sheet during such withdrawal including a member movable along the bottom face of the second sheet into operative position extending substantially across the unsupported portion of said sheet, and means for shifting said member into operative position prior to withdrawal of the bottom sheet and retracting said member after such withdrawal.

7. Sheet feeding apparatus comprising means for supporting a stack of sheets with a portion of the bottom of the stack free from such support, means for deflecting the free marginal portion of the bottom sheet including a picker, rotary means engaging the deflected portion of the bottom sheet and withdrawing the sheet from the stack, and reciprocating means engaging the bottom of the second sheet and extending substantially across the unsupported portion of the second sheet in position to prevent buckling during withdrawal of the bottom sheet.

8. Sheet feeding apparatus comprising means for supporting a stack of sheets, means for with-

drawing the bottom sheet, and means for holding the second sheet against buckling during such withdrawal comprising a sheet-engaging member, means for moving said member into and out of operative position engaging the bottom of the second sheet, and means for rendering said moving means inoperative, independent of the operation of the sheet-withdrawing means.

9. Sheet feeding apparatus as set forth in claim 8, in which the sheet-engaging member is actuated by mechanism engaging a cam and is rendered inoperative by detent means maintaining said mechanism out of engagement with said cam.

10. Sheet feeding apparatus comprising means for supporting a stack of sheets, sheet feeding rotors adjacent the bottom of the stack, means for deflecting a marginal portion of the bottom sheet into engagement with said rotors, and reciprocating means for preventing derangement of the second sheet during withdrawal of the bottom sheet by said rotors comprising second sheet retaining means movable into engagement with the bottom of the second sheet after deflection of the first sheet and extending between the second sheet and said rotors substantially across the entire unsupported portion of the second sheet during withdrawal of the bottom sheet.

11. Sheet feeding apparatus comprising a support for a stack of sheets extending partly across the bottom of the stack leaving a marginal portion of the bottom sheet free from said support; means for withdrawing the bottom sheet from the stack by engagement with said free portion; and means for preventing buckling of the second sheet during withdrawal of the bottom sheet, comprising a member movable into operative position bearing against the bottom face of the second sheet and extending across the buckling zone, and means for moving said member into and out of operative position, said member being stationary during withdrawal of the bottom sheet.

12. Sheet feeding apparatus comprising a support for a stack of sheets extending partly across the bottom of the stack leaving a marginal portion of the bottom sheet free from said support; means for withdrawing the bottom sheet from the stack by engagement with said free portion; and means for preventing buckling of the second sheet during withdrawal of the bottom sheet, comprising a member movable into operative position bearing against the bottom face of the second sheet and extending across the buckling zone, and means for moving said member into and out of operative position, said member being moved to and from operative position in line wtih the direction of withdrawal of the bottom sheet.

13. Sheet feeding apparatus comprising a support for a stack of sheets extending partly across the bottom of the stack leaving a marginal portion of the bottom sheet free from said support; means for withdrawing the bottom sheet from the stack by engagement with said free portion; and means for preventing buckling of the second sheet during withdrawal of the bottom sheet, comprising a member movable into operative position bearing against the bottom face of the second sheet and extending across the buckling zone, and means for moving said member into and out of operative position, said member extending across only a restricted portion of the second sheet in a direction transverse to the direction of withdrawal of the bottom sheet.

14. Sheet feeding apparatus comprising a support for a stack of sheets extending partly across the bottom of the stack leaving a marginal portion of the bottom sheet free from said support; means for withdrawing the bottom sheet from the stack by engagement with said free portion; and means for preventing buckling of the second sheet during withdrawal of the bottom sheet, comprising a member movable into operative position bearing against the bottom face of the second sheet and extending across the buckling zone, and means for moving said member into and out of operative position, said member comprising a relatively long, narrow, flat blade moved into flatwise engagement with the second sheet.

15. Sheet feeding apparatus comprising means for supporting a stack of sheets, means for withdrawing the bottom sheet from said stack and means for preventing derangement of the second sheet during withdrawal of the bottom sheet comprising a pivoted arm engaging a free marginal portion of the bottom of the second sheet during withdrawal of the bottom sheet, and means for oscillating the arm into operative position during withdrawal of the bottom sheet and out of register with the stack during initial engagement of the bottom sheet by the withdrawing means.

16. Sheet feeding apparatus comprising means for supporting a stack of sheets, means for withdrawing the bottom sheet from the stack, and means for preventing derangement of the second sheet during withdrawal of the bottom sheet including means movable into and out of retaining engagement with a margin of the bottom of the second sheet and edges of adjacent sheets, means movable into and out of engagement with an unsupported portion of the bottom of the second sheet adjacent said margin for preventing buckling, and means including a common shaft for actuating both of said movable means.

17. Sheet feeding apparatus as set forth in claim 12 in which the withdrawal means includes rotary devices located adjacent the stack bottom and an actuating shaft for said devices extending parallel to said bottom and constituting the common actuating shaft for the movable means, the means for preventing buckling being located in operative position between the second sheet and said rotary devices.

18. An attachment for sheet feeding apparatus which includes a frame, means for supporting a stack of sheets, means for withdrawing the bottom sheet from the stack, means movable into and out of engagement with a bottom edge of the stack to retain the marginal portion of the lowermost sheet in position during withdrawal of the bottom sheet, and drive means for said apparatus, said attachment comprising a frame member arranged for mounting on the frame of the apparatus, a sheet-supporting member mounted on the frame member for movement into and out of enegagement with an unsupported portion of the bottom of the second sheet in position to prevent buckling of said portion during withdrawal of the bottom sheet, and means carried by said frame member for actuating said sheet-supporting member from said drive means.

ABRAHAM NOVICK.

CERTIFICATE OF CORRECTION.

Patent No. 2,315,646. April 6, 1943.

ABRAHAM NOVICK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 40, claim 4, for "position" second occurrence, read --portion--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of May, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)