April 2, 1940. H. L. METZGER 2,195,576

FEEDING DEVICE

Filed July 16, 1938 3 Sheets-Sheet 1

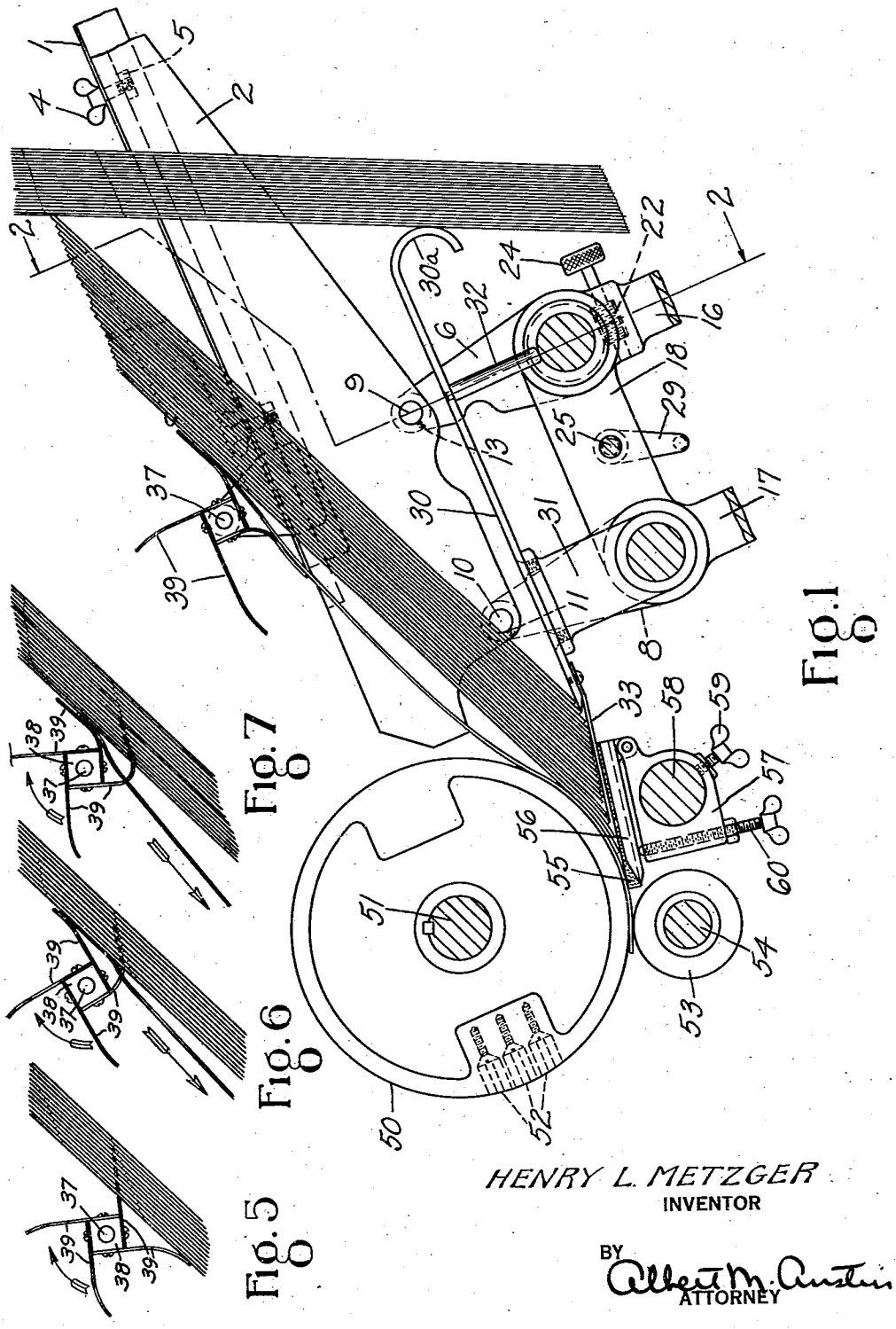

Fig. 1

Fig. 5

Fig. 6

Fig. 7

HENRY L. METZGER
INVENTOR

BY Albert M. Austin
ATTORNEY

April 2, 1940. H. L. METZGER 2,195,576

FEEDING DEVICE

Filed July 16, 1938 3 Sheets-Sheet 2

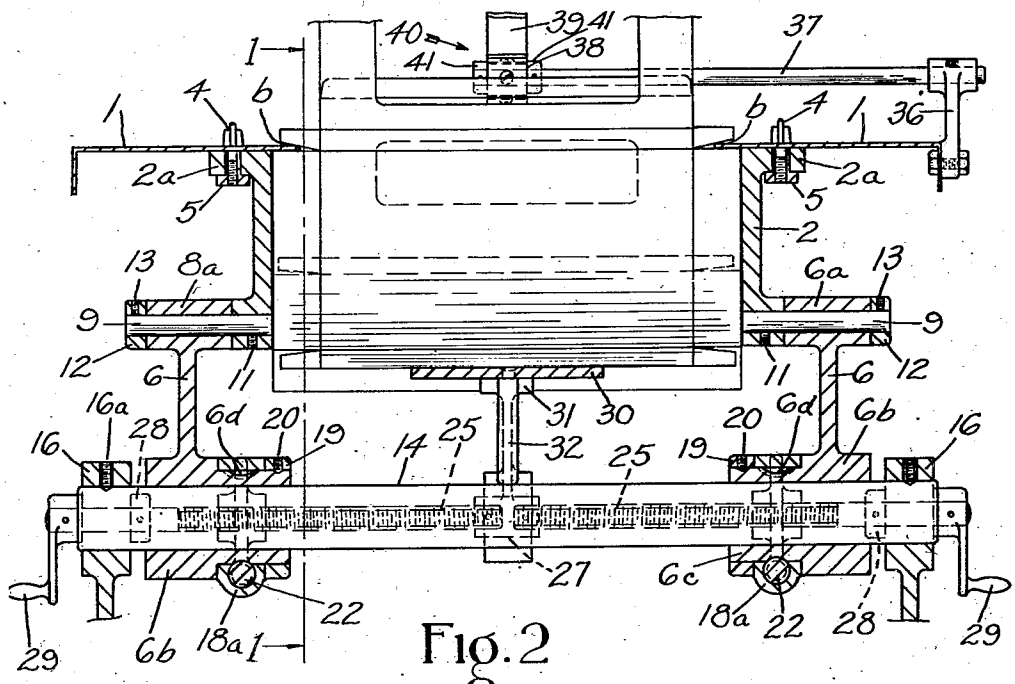

Fig. 2

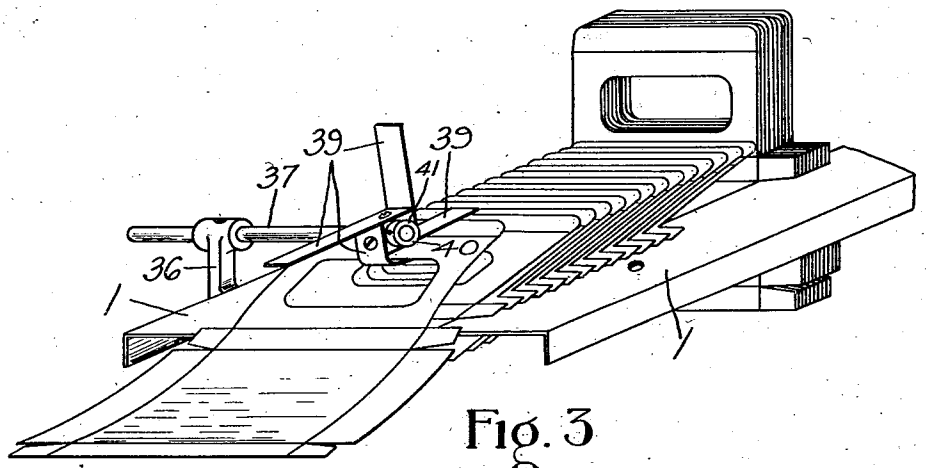

Fig. 3

HENRY L. METZGER.
INVENTOR

BY Albert M. Austin
ATTORNEY

April 2, 1940. H. L. METZGER 2,195,576

FEEDING DEVICE

Filed July 16, 1938 3 Sheets-Sheet 3

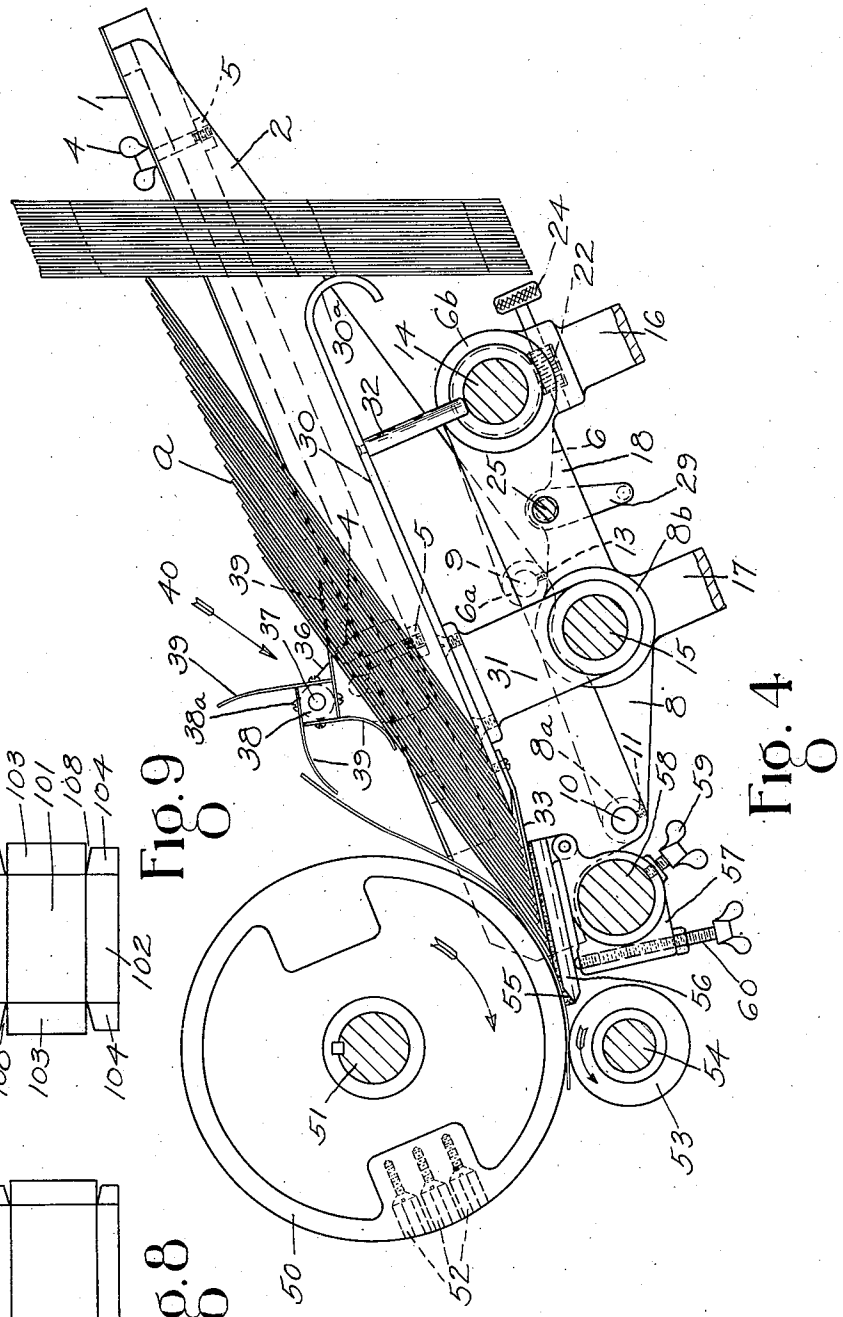

Fig. 4

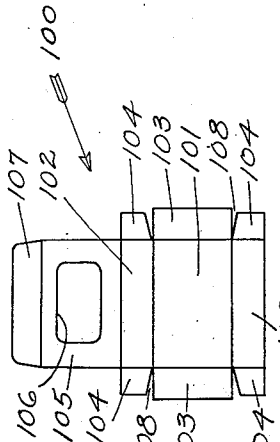

Fig. 9

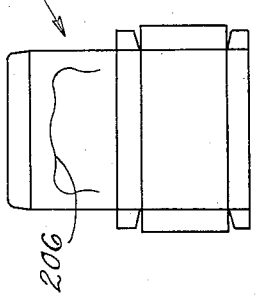

Fig. 8

HENRY L. METZGER.
INVENTOR

BY Albert M. Austin
ATTORNEY

Patented Apr. 2, 1940 2,195,576

UNITED STATES PATENT OFFICE

2,195,576

FEEDING DEVICE

Henry L. Metzger, Castleton on Hudson, N. Y., assignor to The International Paper Box Machine Company, Nashua, N. H., a corporation of New Hampshire

Application July 16, 1938, Serial No. 219,517

19 Claims. (Cl. 271—39)

This invention relates generally to feeding devices and more particularly to an improved device for feeding blanks of sheet material, such as box blanks, envelope blanks, and others.

In feeding sheet material blanks, such as box blanks, envelope blanks, and others, to converting machines, such as folders, gluers, setting-up machines or the like, the blanks are often arranged in a jogged stack or jogged pile and the blanks removed successively from the top or leading end, by a suitable feed member for delivery to the converting apparatus. In prior feeding devices the angle at which the leading blank approaches the feed wheel or other feed member varies as the height of the pile changes and thus the location of the "feeding section" of the blank, or the portion gripped by the feed member, changes with variations in the height of the pile. Furthermore, it often happens that when blanks are added to the bottom or trailing end of the pile, one or more of the blanks in the pile are forced out beneath the leading blank, with the result that the feed member withdraws more than one blank from the pile.

In many cases the blanks are provided with flaps, tucks, windows or other constructional features which tend to interengage or lock during the feeding operation and interfere with the proper feeding of the blanks. Various expedients have been employed in an attempt to overcome this difficulty but most of them involve manual manipulation of the blanks and are not satisfactory with modern high speed machines.

In accordance with a preferred embodiment of the present invention, the blanks are supported in a jogged pile or stack by a hopper or chute having a floor adapted to support the lower edges of the blanks and side members provided with projecting blade portions which engage extensions or projections, such as flaps, tabs or the like, of the blanks to maintain the blanks at a fixed angle of feed relative to a feeding member, such as a combing wheel. The blade portions also serve to prevent any lower blanks from pushing beneath the upper blanks and also prevent hooking or interengaging of any projections, flaps, tabs or the like, as the blanks are successively removed from the stack. The blanks are withdrawn successively from the top or leading portion of the stack by a suitable feed member, such as a combing wheel, which engages the leading portion of the topmost or leading blank and draws it away from the stack. The hopper or chute is so formed that additional blanks can be added at the lower or trailing end of the stack without changing the angle of feed of the blanks in the stack and the chute so guides the blanks that they are automatically fanned out or jogged as they advance along the chute; the chute preferably is inclined so that the blanks advance therealong by gravity. Preferably, the chute is provided with end extensions which permit a reserve quantity of blanks to be supported thereon in a position from which they can be readily shifted into feeding position in the chute by merely deflecting a portion of the blanks.

The device also may be provided with a rotatable separator mechanism, including one or more flexible arms, and actuated by the forward movement of the leading blank to engage one of the flexible arms with the trailing portion of the topmost blank whereby to lift this portion of the blank clear of the remaining blanks and thus prevent hooking or interlocking of the blanks with the remaining blanks of the stack.

An object of the present invention is the provision of a feeding device for blanks or the like wherein the blanks are delivered from a stack or pile to a feeding member at a controlled, uniform angle regardless of the height of the stack or pile.

Another object of the present invention is the provision of a feed mechanism for sheet material blanks adapted to feed blanks having tucks, openings, slits, flaps or other parts likely to engage or lock with corresponding parts of adjacent blanks.

Another object of the invention is the provision of feeding mechanism for paperboard blanks capable of feeding the blanks at high speed without interlocking or entangling of the blanks.

Still another object of the invention is the provision of an improved feeding mechanism wherein a surplus of blanks can be conveniently disposed in readiness for feeding and can be moved into feeding position quickly and simply.

Another object of the invention is the provision of apparatus for feeding blanks having window openings wherein blanks can be fed in one by one in a pile in a fully automatic manner and without the necessity for manual operations.

Another object of the invention is the provision of a reservoir for the blanks having a convenient arrangement for storing a reserve of blanks in readiness for feeding, which permits rapid and easy replenishment of the blanks and convenient movement of the blanks from the storage position into feeding position without the interruption of the operation of the machine.

Various other features and advantages of the

invention will be apparent from the following particular description and from an inspection of the accompanying drawings.

In the accompanying drawings there is shown for purposes of illustration one form of a device embodying the invention, in which:

Fig. 1 is a view of a longitudinal vertical section taken through one form of apparatus constructed in accordance with the invention, the section being taken along line 1—1 of Fig. 2;

Fig. 2 is a transverse cross-sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary perspective view showing a portion of the apparatus and illustrating particularly the guiding of the blanks by the side members and the raising of the leading blank from the stack of blanks;

Fig. 4 is a view similar to Fig. 1 only showing the side members in a different position of adjustment;

Figs. 5, 6 and 7 are fragmentary, side elevational views of the separator mechanism illustrating respectively different successive positions of the mechanism;

Fig. 8 is a top plan view of one form of blank which can be fed by the present apparatus; and

Fig. 9 is a top plan view of another type of blank which the present apparatus is adapted to feed.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit. Like reference characters denote like parts in the several figures of the drawings.

The feeding device, in accordance with the present invention, may employ any one of several different types of pull-out mechanisms for removing the blanks from a stack or pile individually and successively. For the purposes of illustration, there is shown a combing wheel and retard, illustrated particularly in Fig. 1.

This mechanism comprises a combing wheel 50 carried for rotation on a shaft 51 and provided with one or more rubber pads 52. Cooperating with the combing wheel 50 is a wheel 53 carried for rotation on a shaft 54 adjacent the combing wheel. A retard is disposed adjacent the combing wheel 50 and comprises a pad 55 preferably formed of rubber carried in a frame 56, pivotally secured on a bracket 57. The bracket 57 is supported on a transverse shaft 58 and adjustably secured thereon as by a wing nut 59. An adjusting bolt 60 is threaded into the bracket 57 and supports the frame 56 at a point removed from its pivot to permit adjustment of the retard pad 55 relative to the combing wheel 50.

The feed chute constructed in accordance with the present invention is mounted on a suitable frame or housing (not shown) adjacent the converting apparatus (not shown) with which it is to be used and in cooperative relation with the combing wheel and retard, as illustrated in Fig. 1. The feed chute is of generally similar construction on the two sides of its longitudinal center line and therefore, only one side of the apparatus will be described in detail, it being understood that insofar as the other side is not described, it is similar.

The feed chute comprises a hopper preferably open at both ends and constituted by a floor 30 and spaced side members or guides 2, 2. The side guide 2 is adjustably supported by pivot pins 9 and 10 journaled in bearing portions 6a and 8a of adjustable arms 6 and 8 and is secured therein by a collar 12; the side guide 2 and collar 12 are secured on the pins 9 and 10 as by set screws 11 and 13, respectively. The arms 6 and 8 are formed with bearing portions 6b and 8b, respectively, which mount the arms 6 and 8 on transverse shafts 14 and 15. The transverse shafts 14 and 15 are suitably mounted in bearing brackets 16 and 17 supported on or forming a portion of the main frame or housing (not shown). The shafts 14 and 15 are locked in position in their respective bearings by set screws 16a and 16b (not shown).

The hub portions 6b and 8b are connected by a bracket 18 having eye portions 18a and 18b at its ends receiving reduced journal portions 6c and 8c (not shown) of the arms 6 and secured thereon as by collars 19 and set screws 20. Threads 6d are cut in the peripheries of the hub portion 6b and a worm 22 is threaded in the eye portion 18a and meshes with the threads 6d. An adjusting knob 24 permits manipulation of the worm thereby providing for adjustment of the arm 6 angularly about the eye portion 18a of the bracket 18.

Threaded through the bracket 18 is a screw 25 which is threaded into a collar 27 at the center of the mechanism; a similar screw 25 is threaded through the bracket 18 at the opposite side of the mechanism and into the collar 27. The screws 25, 25 also extend through the frame or bracket (not shown) and are suitably positioned by collars 26 and operating handles 29. Upon manipulation of either handle 29 the corresponding bracket 18 is adjusted laterally of the machine thereby adjusting the position of the arms 6 and 8 and the side guide 2 correspondingly.

The side guide 2 is provided with a flange 2a which supports a guide rail or blade 1 preferably constituted by an angle and secured to the flange 2a as by wing screws 4 and 5. The blade 1 projects inwardly beyond the inner face of the side guide 2 for a purpose which will hereinafter appear.

The floor or bottom plate 30, having a smooth, highly polished upper surface, is supported by a bracket 31 mounted on a shaft 15 and by a stud 32 resting upon the shafts 14. At its forward end the plate 30 is formed with a thinned edge portion and has secured thereto a relatively flexible floor piece or apron 33 which may be formed by spring steel and which projects substantially beyond the end of the floor 30, and is adapted to rest upon the retard pad 55. At its rearward end the bottom plate is provided with a downwardly curved flange 30a.

In certain cases it is desirable to provide a separator mechanism for guiding each blank away from the stack as it is withdrawn therefrom. The separator mechanism 40 is mounted above the plate 30, and between the side guides 2 in a position above the stack of blanks, and comprises a pluurality of resilient, extremely flexible arms 39 secured on a hub 38 as by screws 38a. The hub 38 is freely rotatable on a shaft 37 and is positioned thereon as by collars 41. The shaft 32 is suitably carried in a bracket 36 secured to one of the side rails 1.

While the apparatus thus far described is suitable for use in connection with a large variety of different types of blanks, it is described in connection with one type of blank which is in common use, which blank is illustrated in Fig. 5. The blank 100 comprises a bottom 101, side panels 102, end panels 103, tucks or end closure tabs 104, and cover 105 having a window 106 therein and a cover flange 107; the end panels 103 and

adjacent closure tabs **104** are separated by cuts **108**.

A somewhat similar blank **200** is illustrated in Fig. 4 except that the cover is provided with a cut line **206** instead of a window.

The operation of the apparatus is as follows:

A stack or pile of blanks **100** is disposed in feeding position between the side guides **2** with the lower edges of the blanks resting upon the floor **30** and the upper cuts **108** receiving the projecting edges of the side rails **1**, as illustrated in Figs. 2 and 3. The weight of the blanks causes them to slide down the hopper and in so doing they are fanned out until they assume the fanned or jogged position illustrated; if need be, movement of the leading blanks along the chute may be assisted by the operator. The leading blank or blanks may rest on the retard pad; the next group of blanks rest upon the apron **33**; the remainder of the pile rest upon the floor **30**.

Additional blanks **100**, which need not be jogged or fanned, may be hung on the side rails **1** as illustrated, in storage position in readiness to be placed in the jogged or feeding position. These blanks bear against the flange **30***a* and cannot move forwardly into feeding position until the lower ends are raised and placed on the floor **30**.

The combing wheel **50** is rotated, thereby drawing the leading and lower edge portion of the topmost or first blank into the nip of the combing wheel **50** and the cooperating wheel **53**; the retard pad **55** prevents the second blank from being drawn forwardly by the combing wheel. As the blanks are drawn from the stack, the succeeding blanks slide by gravity down the chute and are automatically advanced into position to be engaged successively by the combing wheel.

The blades or side rails **1** positively engage the blanks and thus support them at a controlled, uniform angle with respect to the floor and to the combing wheel. Thus, regardless of the number of blanks in the stack, the leading blank is always guided to the combing wheel at the same angle (for any one adjustment of the mechanism), and the combing wheel engages each blank in the same manner, resulting in a uniform feeding action. The blades or side rails **1** also prevent hooking or interlocking of the flaps and tabs of the several blanks as the topmost blank is drawn forwardly.

During the withdrawing of the leading blank from the stack, the separator mechanism **40** is actuated to move the blank clear of the stack so that the flaps and tucks do not hook the remaining blanks. At the start of this action one of the flexible arms **39** is in the opening provided by the windows **106**, as shown in Fig. 5. The forward and downward movement of the blank causes the upper edge of the window **106** to bear against the arm **39**, whereupon the hub **38** is turned about its axis and at the same time the flexible arm **39** is bent, as shown in Fig. 6.

Further movement of the blank causes further bending of the arm **39**, as shown in Fig. 7, and movement of the arm about its axis. The arm **39** is finally withdrawn from the opening in the stack and springs free and also is withdrawn from the window in the leading blank, as shown in Fig. 1.

During the foregoing action, the arm **39** raises the trailing portion of the blank away from the remaining blanks in the stack so that the end flaps, tucks and the like cannot interengage with those of the remaining blanks.

During the action thus far described, the separator mechanism is rotated to bring the next succeeding arm **39** into contact with the top blank of the stack, as shown in Fig. 7, and, as the separator is further rotated, this arm enters the windows of the stack of blanks. As the next succeeding blank is drawn forwardly, the action above described is repeated.

When it is desired to replenish the pile of blanks which are in feeding position, a suitable quantity of blanks are shifted from the storage position to the feeding position by merely swinging or deflecting the bottom edges of the blanks and seating them on the floor; the top portions of the blank can slide backwardly along the guides **2** to permit the lower portions to be swung forwardly. This movement of the blanks into feeding position automatically fans out or jogs the blanks, and, as the blanks slide down the chute, they are automatically guided into the proper feeding angle, and the pile assumes the proper condition for feeding. It is not necessary to raise or otherwise manipulate the blanks previously in feeding position.

The device is capable of adjustment for operation with blanks of various sizes. The height of the side guides above the floor **30** can be adjusted by adjustment of the knob **24** to thereby swing the arm **6** about the shaft **14**. Inasmuch as the arms **6** and **8** are rockable about spaced, fixed pivots and are connected to their outer ends to the pins **9** and **10**, angular movement of the bracket **6** about their pivot will effect translational movement of the side guides **2**, as will be understood. This adjustment, therefore, permits the machine to be employed with blanks of widely varying sizes, since by a suitable adjustment of the side rails for blanks of various sizes, the desired angle of feed can be maintained.

In Fig. 1 the apparatus is shown as adjusted with the side guides **2** in an upper position of adjustment and adapted to guide a relatively long blank. In Fig. 4, the apparatus is shown with the side guides swung down to a lower position of adjustment to accommodate a relatively short blank.

A further adjustment is provided in that the retard pad can be variably positioned by suitably adjusting the bracket **57** relative to the shaft **58** or the position of the frame **56** relative to the bracket **57** or both.

The lateral spacing of the side rails or blades **1** can be adjusted to accommodate the apparatus for blanks of various widths. This may be accomplished by actuation of either or both of the adjusting handles **29** to slide either or both of the brackets **18** laterally, which brackets carry with them the arms **6** and **8** and the side guides **2**. The side rails **1** can be adjusted on the side guides **2** in order to adjust the amount that the side rails project inwardly beyond the inner faces of the side guides **2**.

In order to position the rotating portion of the separator mechanism in position so that the arms will enter the windows, the hub **38** may be adjusted in the shaft or the side guides may be adjusted to bring the blanks into the proper position.

From the foregoing it will be seen that the present apparatus provides a desirable means for feeding blanks in a uniform manner regardless of the number of blanks in the stack. The side rails enter the cuts in the blanks between the end flaps and the closure tabs or tucks and guide the blanks properly as they slide along the chute. The side rails also provide a convenient support

for additional blanks which latter can be placed in position for feeding by merely raising the lower ends of the blanks and resting them on the floor. Thus it is possible to place the desired number of blanks in feeding position and dispose an additional quantity of blanks in position in readiness for feeding. The operator can thus shift any desired number of blanks from storage position to feeding position by a simple rapid manipulation; the side rails individually engage the cuts in the blanks and prevent interlocking of the blanks when they are formed out.

The separator mechanism provides an efficient and highly effective means for preventing hooking or interlocking of blanks having windows, cuts or other openings, as the blanks are removed from the stack. This mechanism is operated entirely by the movement of the blank leaving the stack and does not require any driving means or interconnection with the remainder of the apparatus but is inherently synchronized with and timed by the feed of the blanks.

The blanks are advanced along the hopper by gravity depending upon the rate at which they are removed from the stack and no additional feeding or conveying means is required. The blades not only maintain the blanks at the desired and proper angle for engagement with the combing wheel or other delivery mechanism regardless of the number of blanks which may be in the stack, but also prevent interlocking of any flaps, tabs, extensions or the like.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. Apparatus for feeding blanks, which comprises a blank feed member for removing blanks successively from a stack, means for supporting a jogged stack of blanks in position whereby the topmost blank is engaged and removed by said feed member, and means for maintaining said stack of blanks at a constant angle relative to said feed member.

2. Apparatus for feeding blanks, which comprises a feed member for withdrawing blanks successively from a stack, means for supporting a jogged stack of blanks for gravity delivery to said feed member, and means for guiding said blanks along said supporting means at a constant angle relative to said feed member.

3. Apparatus for feeding blanks which comprises a feed member for withdrawing blanks successively from a stack, means for supporting a plurality of blanks, and inclined guiding means between said supporting means and said feed member and engageable with the side edges of said blanks for automatically fanning out a stack of blanks inserted therein from said supporting means and for advancing the blanks by gravity to said feed member.

4. Apparatus for feeding blanks comprising a feed member, means for supporting a stack of blanks for delivery to said feed member including a floor for supporting the lower edges of the blanks, means for advancing said blanks to said feed member, and means for guiding the blanks at a controlled predetermined angle relative to said feed member including side members engageable with and positively supporting each of the blanks of said stack individually.

5. Apparatus for feeding blanks comprising a chute substantially open at both ends and adapted to receive a stack of unfanned blanks at its charging end, guide means intermediate the ends of the chute for positively imparting a predetermined inclination to said blanks, means for advancing blanks along said chute and coacting with said guide means to fan out the blanks as they advance along the chute, and feed means adjacent the discharge end of the chute for withdrawing blanks successively from the fanned out stack.

6. Apparatus for feeding blanks comprising a pull-out wheel, means for supporting a stack of blanks adjacent said pull-out wheel including a support adapted to receive a stack of blanks at one side thereof, and means for presenting blanks to said pull-out wheel in a jogged pile whereby the topmost blank is removed by said pull-out wheel.

7. Apparatus for feeding apertured sheet material blanks comprising means for supporting a stack of blanks, means for conveying blanks individually away from said stack, and means intermittently entering the apertures in the stacked blanks and actuated by the movement of the leading portion of a blank from said stack for lifting the remainder of the blank away from the stack.

8. Apparatus for feeding blanks comprising means for supporting a jogged pile of blanks, means for withdrawing the blanks individually and successively from said stack, and rotary means actuated by initial withdrawing movement of a blank for moving the trailing portion of the blank clear of the pile.

9. Apparatus for feeding apertured blanks comprising a supporting table for a stack of blanks, means adjacent said supporting table and intermittently engageable with the rearward edges of the apertures in said blanks for preventing interlocking of adjacent blanks, and means for withdrawing the blanks individually and successively from said supporting table.

10. Apparatus for feeding blanks comprising a supporting table, means adjacent said supporting table and engageable with blanks on said table for supporting and guiding the blanks at relatively fixed, controllable, angle relative to said table, and means for withdrawing the blanks individually and successively from said supporting table.

11. Apparatus for feeding blanks comprising a supporting table, means engageable with a lateral shoulder of a blank for supporting the blank in predetermined position on said table and for guiding the blank along the table at a fixed angle relative to the table, said means extending beyond said table and providing means for supporting a reserve of blanks, and means for withdrawing blanks individually and successively from said table.

12. Apparatus for feeding blanks which comprises a pull-out wheel, a delivery chute disposed adjacent said pull-out wheel and including a bottom support and side guides, said side guides having projections engageable with lateral shoulders of a blank for positioning said blank and controlling the angular position of said blank relatively to said pull-out wheel as the blank moves along said chute, and means mounting said side guides for adjustment relative to said bottom support.

13. Apparatus for feeding blanks having openings therein comprising means for supporting a jogged pile of blanks, means for withdrawing the

blanks from said pile, and means including a freely rotatable member mounted adjacent said pile and having a resilient, flexible arm positioned to extend through the openings in said blanks and actuated by the forward movement of a blank away from said pile for guiding the blank out of engagement with the remaining blanks in said pile.

14. Apparatus for feeding blanks having openings therein comprising means including a floor for supporting a plurality of blanks, means including blades engageable with cuts in the blanks for supporting the blanks in inclined, jogged position, means engageable with the lower, leading portion of the topmost blank of the pile for withdrawing the blanks from said pile, means including a freely rotatable member mounted adjacent said pile and having a flexible arm positioned to extend through the openings in said blanks and actuated by the forward movement of the topmost blank away from said pile for guiding the blank out of engagement with the remaining blanks in said pile.

15. Apparatus for feeding blanks having openings therein comprising means for supporting blanks in a jogged pile, means for withdrawing blanks from said pile in succession, and means actuated by the movement of a blank from said pile for guiding said blank out of contact with the remaining blanks in said pile, said last means comprising a rotatable member having a plurality of resilient, flexible arms extending in spaced, radial relation and adapted to enter respectively into the openings of the succeeding blanks of said pile as the preceding blank is withdrawn and operable to move at least a portion of the blank clear of the remaining blanks upon movement of the blank, said arms being spaced so that they successively cooperate with successive blanks in said stack.

16. Apparatus for feeding blanks comprising means for supporting a jogged pile of blanks, means for withdrawing the blanks successively from said pile, means engageable with projecting portions of said blanks for guiding the blanks toward said withdrawing means at a uniform angle regardless of the number of blanks in the pile, and means operable upon initial withdrawing movement of a blank for guiding the blank out of contact with the remaining blanks in the pile.

17. Apparatus for feeding blanks having openings, said apparatus comprising means for supporting a jogged stack of blanks, rotary feed means engageable with the leading blank of the stack for withdrawing blanks from the stack individually and successively, and means engageable with the openings in said blanks respectively for preventing the withdrawal by said feed means of any except the leading blank of the stack.

18. Apparatus for feeding blanks comprising means for supporting a jogged stack of blanks, rotary feed means engageable with the leading blank of the stack for withdrawing blanks from the stack individually and successively, means for advancing blanks on said support into position for engagement by said rotary feed means, and means engageable with shoulders on said blanks for guiding said blanks at a predetermined angle relative to said feed means and for preventing the withdrawal by said feed means of any except the leading blank of the stack.

19. Apparatus for feeding blanks of paper or paperboard, which comprises means including a feed member for withdrawing blanks successively from a stack, supporting means including a chute having open forward and rearward ends and adapted to support a plurality of blanks in a jogged stack with the leading blank in position to be engaged and withdrawn by said feed member, means engageable with said blanks for positively maintaining the angularity thereof whereby to permit the addition of blanks to the rear of said stack without altering the angularity of the blanks in said stack, and means mounting said chute with its forward end adjacent said feed member.

HENRY L. METZGER.