SPRING FEEDER FOR WARPED BOARD


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8 Claims. (Cl. 271—44)

The instant invention relates to an automatic feeding mechanism which feeds sheets of cardboard or corrugated board one at a time from a stack and more particularly to a novel feeding mechanism that is readily adjustable to handle a stack of severely warped boards.

In the manufacture of corrugated paper boxes the sheets or box blanks are often stored for long periods of time in such a manner that they become severely warped. When a stack of warped boards is placed on the bed of a feeding mechanism supplying a high speed automatic folding machine of the type disclosed in my U.S. Patent 2,622,493, if the boards are severely warped the leading edge of the board being fed will not be properly positioned to pass through the feed space between the front gauge and the bed. Thus the feeding mechanism will jam and the automatic operation of the folding machine will be interrupted. Prior art feeding mechanisms for handling warped board, as exemplified in U.S. Patent 2,583,713 were cumbersome to adjust and not flexible in that they could only handle boards having a limited degree of warp.

This invention provides a novel structure which includes means for readily raising the rear gauges of the feeding mechanism a substantial distance which in turn raises a plate support member carried by the rear gauges and extending laterally across the feed path of the sheets. Raising the plate support member raises a set of inclined lips carried thereof which in turn raise the trailing edge of the stack is arranged with its outwardly bowed surface toward the bed, the leading edge thereof is lowered until the bottom sheet of the stack rests on the beveled surface of the bar which forms the bottom of the feed space. A plurality of support plates are hinged at one end to the kicker bar so as to be carried thereby. The support plates also rest on the plate support member so that as the kicker bar is reciprocated support plate will be continuously changing its angular position with respect to the bed of the feeding mechanism.

A spring kicker is secured to and carried by each of the support plates and is positioned to engage the trailing edge of the bottom sheet in the stack to drive it forward. As the kicker bar moves forward the angle between the pivoted support plate and the bed decreases whereby lowering the spring kicker. This arrangement is necessary since the bottom of the stack is closer to the bed at the leading edge than at the trailing edge.

However, the distance between the bed and the securing points on the support plates to which the spring kickers are affixed decreases linearly as the kicker bar approaches the feed space. But the distance between the bottom of the stack and the bed does not decrease linearly between the front and rear gauges so that the distance between the securing points and the bottom of the stack varies as the kicker bar reciprocates. The spring kickers are sufficiently resilient so that they will remain firmly engaged with the trailing edge of the sheet at all times and after driving one sheet forward return to the trailing edge of the stack to engage the bottom sheet and thereafter drive this sheet forward.

Accordingly, a primary object of the instant invention is to provide an automatic feeding mechanism which will handle more severely warped boards than prior art devices of this type.

Another object is to provide an automatic feeding mechanism which is readily adjustable to accommodate stacks of boards having varying degrees of warp. Still another object is to provide an automatic feeding mechanism which includes spring kickers secured to points whose distances from the bed of the mechanism decrease gradually as the spring kickers approach the front gauge.

A further object is to provide an automatic feeding mechanism which includes a rear gauge supported on the outwardly bowed side of the stack and also includes means for readily adjusting the angle of the lifting arm thereby adjusting the height of the rear gauge and the members carried thereby which support the trailing edge of the stack of warped board as well as altering the path of the spring kickers.

A still further object is to provide an adjusting means to adjust the height of the means supporting the trailing edge of the stack with the stack thereby.

Yet another object is to provide support plates, pivoted to the kicker bar, for carrying the spring kickers.

These as well as other objects of the instant invention will become apparent after reading the following description of the accompanying drawings in which:

Figure 1 is a side elevation of my novel automatic feeding mechanism.

Figure 2 is a fragmentary side elevation with the spring kickers advanced slightly forward of their position in Figure 1.

Figure 3 is a view similar to Figure 2 with the spring kickers advanced forward of their position in Figure 2.

Figure 4 is an enlarged fragmentary side elevation showing details of the rear gauge and spring kickers.

Figure 5 is a fragmentary plan view of the rear portion of the automatic feeding mechanism.

Figure 6 is a schematic illustration of the manner in which the leading edge of the bottom sheet is brought into alignment with the feed space.

Referring to the figures, a stack 90 of warped boards 91 is placed on platforms 11 of automatic feeding mechanism 10 with the outwardly bowed side 92 of stack 90 facing bed 11. Side gauges 12 position stack 90 laterally with respect to the feed path while the front 13 and back 14 gauges maintain stack 90 in the appropriate longitudinal position. Front gauge 13 is vertically adjustable, in a manner well known to the art, and cooperates with bar 15 to define feed space 16 which is high enough to permit one blank 91 to pass through while holding back the rest of stack 90.

Rear gauges 14 are secured to cross member 17 which positioned on the top side of bed 11 and extends between lifting arms 18, 19 at one of the ends thereof. The longitudinal position of cross member 17 is adjustable by screw means 20, 21 which are disposed in arm slots 22, 23. After cross member 17 has been positioned so that rear gauges 14 rest against the trailing edge of stack 90, screw means 20, 21 may be tightened to maintain cross member 17 in this position.

The other ends of lifting arms 18, 19 are pivotally mounted at 24, 25 to the frame. Cross member 26 extends between lifting arms 18, 19 at an intermediate point thereof and carried a downwardly extending threaded member 27. Adjusting screw 28 is freely rotatable with respect to the frame but is secured thereby against axial movement while being in threaded engagement with member 27.
Thus hand or foot rotation of wheel 29 secured to the end of screw 28 will cause rotation thereof and thereby raise or lower cross member 26. This in turn will cause lifting arms 18, 19 to pivot about pivots 24, 25 as a center to raise or lower the rear gauges 14 in a convenient manner.

Wheel arms 18, 19 in their lowermost position, a stack 90 of severely warped boards 91 will be entirely supported by bed 11 (Figure 6) with the bowed center 92 of stack 90 in contact with bed 11 while the leading and trailing edges of the stack are both raised a considerable distance above bed 11. At this time the leading edge of the bottom blank 91 will be misaligned with respect to feed space 16.

Rotation of wheel 29 in an appropriate direction will cause lifting arm 18, 19 to pivot clockwise with respect to Figure 1 thereby raising rear gauges 14 until bevel edged support elements 30 contact the bottom of stack 90 at the trailing edge thereof. Further rotation of screw 28 will raise elements 30 so that the trailing edge of stack 90 is now supported thereby. Raising the trailing edge of stack 90 causes the leading edge to fall until the bottom sheet 91 rests on bar 15 and the leading edge of the bottom sheet 91 is now in alignment with feed space 16 (dotted position of Figure 6).

Referring more particularly to Figure 1, link 50 is pivotally secured at 51 to cranking wheel 25 and at 53 to one end of link 54 whose other end is keyed to stationary shaft 55. Thus a continuing rotation of cranking wheel 25 will be transferred through linkages 50, 54 and impart an oscillatory motion to shaft 56.

Link 56 is keyed to oscillating shaft 55 and pivotally secured to connecting link 57 at 58. Connecting link 57 is also pivotally secured at 59 to carriage 60. In this manner oscillatory motion of link 56 is translated into a reciprocating motion for carriage 60 whose wheels 61 ride on tracks 63 at the bottom of grooves 62 cut in the top surface of bed 11.

Carriage 60 carries feed bar 65 which is longitudinally adjustable with respect thereto in a suitable manner. Feed bar 65 carries a plurality of support plates 66 hingedly secured to support frame 67. Support plates 66 extend rearwardly from feed bar 65 and rest on plate support member 68 which extends laterally across the feed path and is secured to rear gauges 14 below elements 30. Secured to each support plate 66 is a spring kicker 70 which comprises a resilient member 71 extending upwardly at an inclination from support plate 66 and a toothed member 72 having teeth 73 at one edge and a rounded portion 74 at the opposite edge.

With the lifting arms 18, 19 raised to a position where elements 30 are raised sufficiently to align the leading edge of the lowest sheet 91 with feed space 16, moving carriage 60 to the rear will position spring kickers 70 to the left of the stack 90 and at a sufficient height so that spring 71 will be lightly loaded as teeth 73 engage the trailing edge of the bottom sheet 91 during the feedout stroke of feed bar 65. This insures firm contact between spring kickers 70 and sheet 91 so that it may be driven forward through feed space 16 and thereafter engaged by feed rolls 75, 76 and be delivered to a machine for one or more operations.

Support plates 66 form the hypotenuse of a right triangle having one side of constant length equal to the distance between the plate support and the top of feed bar 65. The other side is equal to the horizontal distance between hinge 67 and plate support member 68. As feed bar 65 moves forward in its feedout stroke the length of the other side increases in length bringing about a corresponding increase in the length of the hypotenuse. But the distance between point 77 and hinge 67 remains fixed so that as a percentage of the hypotenuse the distance between point 77 and hinge 67 decreases as feed bar 65 moves forward and point 77 is gradually lowered.

This in turn lowers spring kickers 70. In this manner the loading of springs 71 does not change appreciably during the feedout stroke since the distance between bed 11 and the bottom of stack 90 also decreases gradually between the back 14 and front 13 gauges. Support plates 66 supply a substantially rigid support at 77 for spring kickers 70 so that springings 71 need never be severely loaded. Consequently the contact pressure between toothed member 72 and the bottom of stack 90 is never sufficient to mar the bottom sheet 91 on the return stroke of feed bar 65. The round surface 74 of toothed member 72 reduces rubbing on the return stroke of feed bar 65.

It is to be observed that spring kickers 70 always elevate above bed 11. Bar 15 which defines the lower surface of feed space 16 is also elevated above bed 11 making it possible to take warped sheets 91 without interfering with kicking or ejecting. The undercutting at 78 of bar 15 permits feed bar 65 to enter beneath the leading edge of stack 90 and thus make possible the feeding of short boards.

The elevation of the leading and trailing edges of the lower sheet 91 and bar 15 and spring kickers 70 respectively permits all sheets through the feedout operation to assume the shape of any warped sheet so that all sheets, warped or plane, may be fed out.

Thus I have provided an improved automatic feeding mechanism for feeding individual boards from a stack of severely warped boards. The mechanism is sufficiently flexible so that flat boards as well as boards having varying degrees of warp may be handled equally well after making an adjustment which can be performed while the stack of boards is supported by the bed of the mechanism.

In the foregoing, I have described my invention only in connection with preferred embodiments thereof. Many variations and modifications of the principles of my invention within the scope of the description herein are obvious. Accordingly, I prefer to be bound not by the specific disclosure herein but only by the appended claims.

I claim:

1. In apparatus for successively feeding the bottom sheet in a plane parallel to the said sheet from a stack of said sheets; a platform, side guides for defining the stack of sheets and front guides for maintaining the stack of sheets in position; said front guides extending vertically above the said platform; means between the lower ends of the front guides and the platform equal to slightly more than the thickness of one sheet; means in said feeding device adapted to feed out such sheets when such sheets are warped; said means comprising a horizontally movable feed bar movable along a path on the platform toward and away from the front guides; a third means carried by said feed bar and movable in unison therewith; said third means extending parallel to said path and being supported by a first means; at least one spring kicker operatively connected to said third means and carried thereby; said spring kicker being operatively positioned to engage the trailing edge of the lowest sheet in the stack and drive this sheet forward on the feedout stroke of the feed bar; a second means operatively connected to said first means; said first means supporting the stack at the trailing edge thereof; said second means being connected to adjust the height of said first means with respect to said platform while said stack is being supported by said first means.

2. In apparatus for successively feeding the bottom sheet in a plane parallel to the said sheet from a stack of said sheets; a platform, side guides for defining the stack of sheets and front guides for maintaining the stack of sheets in position; said front guides extending vertically above the said platform; a space between the lower ends of the front guides and the platform equal to slightly more than the thickness of one sheet; means
in said feeding device adapted to feed out such sheets when such sheets are warped; said means comprising a horizontally movable feed bar movable along a path on the platform toward and away from the front guides; a third means carried by said feed bar and moveable in unison therewith; said third means extending parallel to said path and being supported by a first means; at least one spring kicker operatively connected to said third means and carried thereby; said spring kicker being operatively positioned to engage the trailing edge of the lowest sheet in the stack and drive this sheet forward on the feedout stroke of the feed bar; a second means operatively connected to said first means; said first means supporting the stack at the trailing edge thereof; said second means being constructed to adjust the height of said first means with respect to said platform while said stack is being supported by said first means; said second means being comprised of a pair of lifting arms mounted on stationary pivots.

3. The apparatus as set forth in claim 1 in which the second means also includes a rotatable screw journaled by a stationary member and in operative engagement with the pair of lifting arms to control the position thereof.

4. In apparatus for successively feeding the bottom sheet in a plane parallel to the said sheet from a stack of said sheets; a platform, side guides for defining the stack of sheets and front guides for maintaining the stack of sheets in position; said front guides extending vertically above the said platform; a space between the lower ends of the front guides and the platform equal to slightly more than the thickness of one sheet; means in said feeding device adapted to feed out such sheets when such sheets are warped; said means comprising a horizontally movable feed bar movable along the platform toward and away from the front guides; at least one spring kicker operatively connected to said feed bar and carried thereby; said spring kicker being operatively positioned to engage the trailing edge of the lowest sheet in the stack and drive this sheet forward on the feedout stroke of the feed bar; a first means and a second means operatively connected thereto; said first means supporting the stack at the trailing edge thereof; said second means being constructed to adjust the height of said first means with respect to said platform while said stack is being supported by said first means; said second means comprising a pair of lifting arms and a rotatable screw in operative engagement therewith; said screw being journaled by a stationary member; a support plate for each of said spring kickers, extending parallel to the direction of movement of the sheets; one end of said support plate being pivotally secured to said feed bar and the other end of said support plate extending rearwardly of said one end.

5. The apparatus as set forth in claim 4 in which the support plates are in sliding engagement with said first means so that the angle between the support plate and platform decreases as the kicker bar moves toward the front guide.

6. In apparatus for successively feeding the bottom sheet in a plane parallel to the said sheet from a stack of said sheets; a platform, side guides for defining the stack of sheets and front guides for maintaining the stack of sheets in position; said front guides extending vertically above the said platform; a space between the lower ends of the front guides and the platform equal to slightly more than the thickness of one sheet; means in said feeding device adapted to feed out such sheets when such sheets are warped; said means comprising a horizontally movable feed bar movable along the platform toward and away from the front guides; at least one spring kicker operatively connected to said feed bar and carried thereby; said spring kicker being operatively positioned to engage the trailing edge of the lowest sheet in the stack and drive this sheet forward on the feedout stroke of the feed bar; means operable independently of the shape of said stack including at least one member operatively connected to said feed bar for decreasing the distance between said spring kickers and said platform as said feed bar moves toward said front guide.

7. In apparatus for successively feeding the bottom sheet in a plane parallel to the said sheet from a stack of said sheets; a platform, side guides for defining the stack of sheets and front guides for maintaining the stack of sheets in position; said front guides extending vertically above the said platform; a space between the lower ends of the front guides and the platform equal to slightly more than the thickness of one sheet; means in said feeding device adapted to feed out such sheets when such sheets are warped; said means comprising a horizontally movable feed bar movable along the platform toward and away from the front guides; at least one spring kicker operatively connected to said feed bar and carried thereby; said spring kicker being operatively positioned to engage the trailing edge of the lowest sheet in the stack and drive this sheet forward on the feedout stroke of the feed bar; a first means and a second means operatively connected thereto; said first means supporting the stack at the trailing edge thereof; said second means being constructed to adjust the height of said first means with respect to said platform while said stack is being supported by said first means; said second means comprising a horizontally movable feed bar movable along the platform toward and away from the front guides; a first means and a second means operatively connected thereto; said first means supporting the stack at the trailing edge thereof; said second means being constructed to adjust the height of said first means with respect to said platform while said stack is being supported by said first means; said second means comprising a pair of lifting arms and a rotatable screw in operative engagement therewith; said screw being journaled by a stationary member; a support plate for each of said spring kickers, extending parallel to the direction of movement of the sheets; one end of said support plate being pivotally secured to said feed bar; said first means including a plate support member extending transverse to the direction of movement of said sheet; said support plates resting upon said plate support member so that the angle between said support plates and said platform decreases as the feed bar moves forward thereby lowering the spring kickers as they move toward the front guide.

8. The apparatus as set forth in claim 7 also including a stationary bar on the platform in the region of the front guides extending transverse to the direction of movement of the sheets, the leading edge of the lowest sheet in the stack resting on said stationary bar and being elevated above the level of the platform, a recess beneath said stationary bar; a portion of the feed bar being movable into said recess on the feed out stroke of the feed bar.

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CERTIFICATE OF CORRECTION

Patent No. 2,902,280

September 1, 1959

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 20, for the claim reference numeral "1" read -- 2 --.

Signed and sealed this 21st day of November 1961.

(SEAL)
Attest:

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