Aug. 31, 1965 A. F. SHIELDS 3,203,561

LIFT CAM FOR STACKING DEVICE

Original Filed Feb. 8, 1961 3 Sheets-Sheet 1

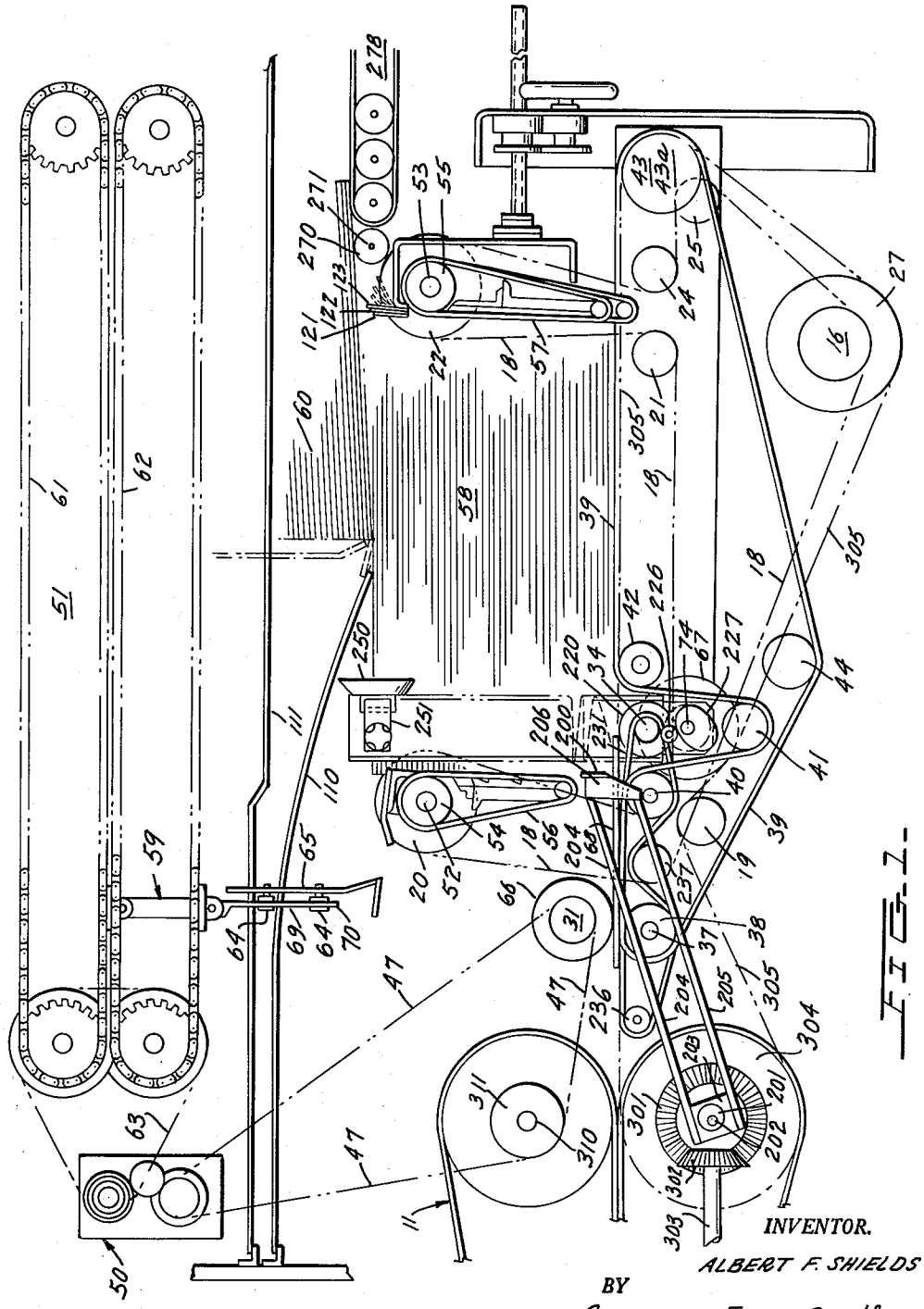

FIG. 1.

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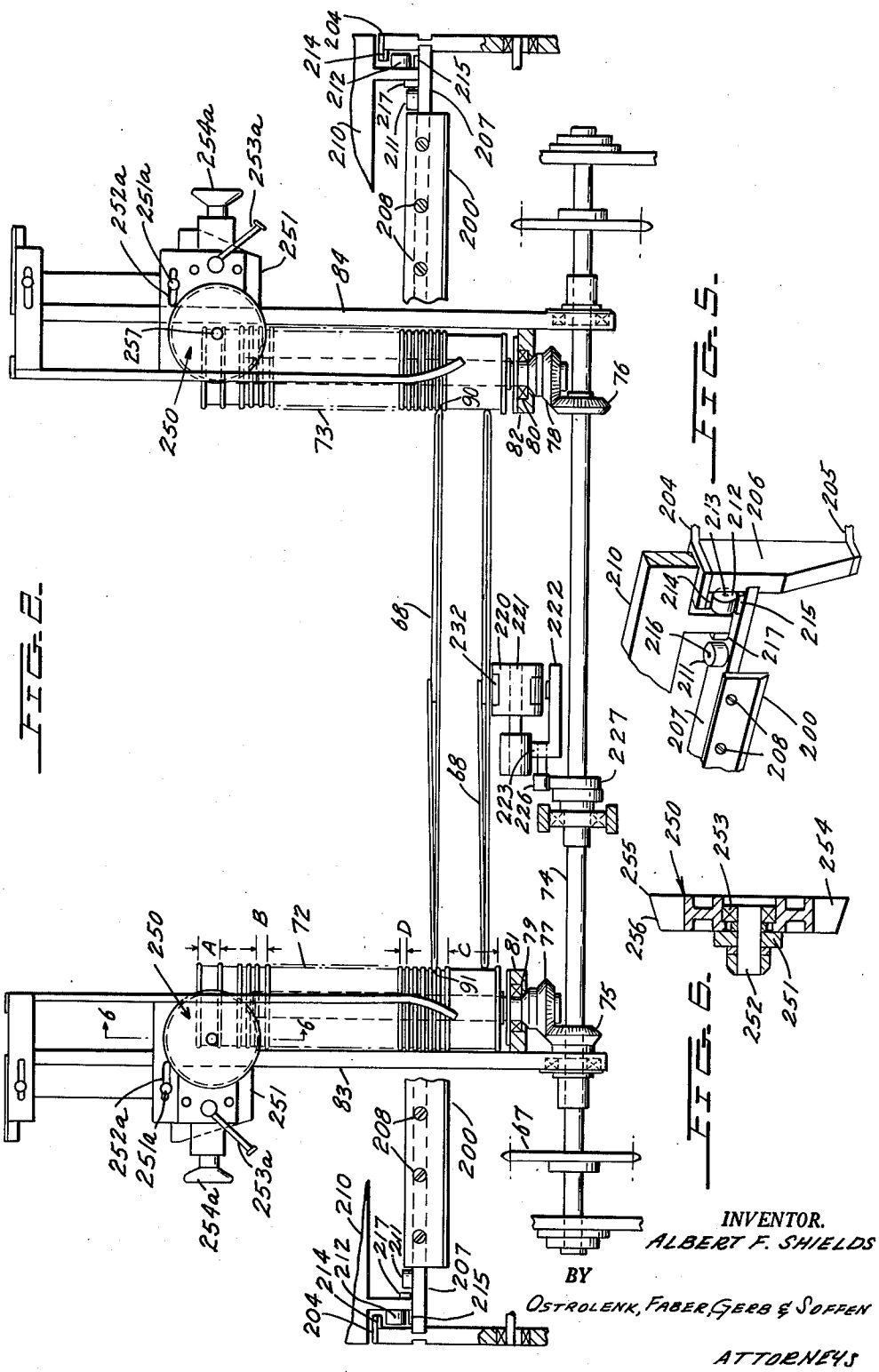
Original Filed Feb. 8, 1961 3 Sheets-Sheet 2



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LIFT CAM FOR STACKING DEVICE

Original Filed Feb. 8, 1961 3 Sheets-Sheet 3

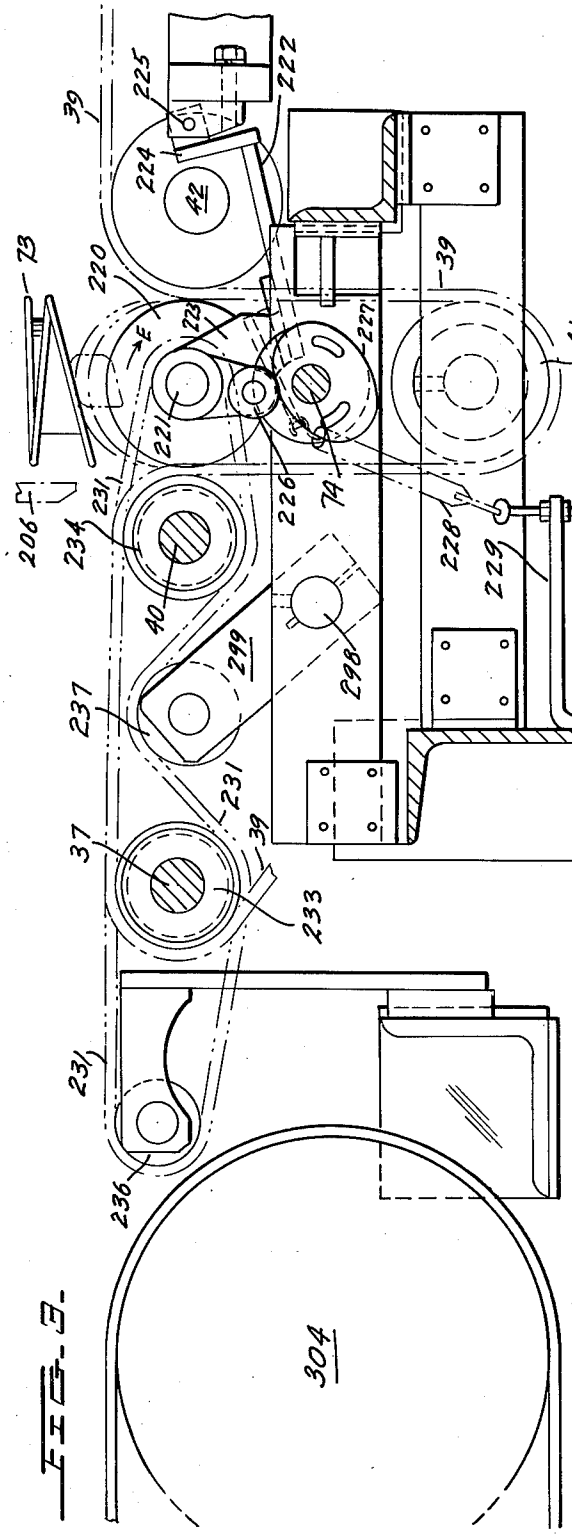

FIG. 3.

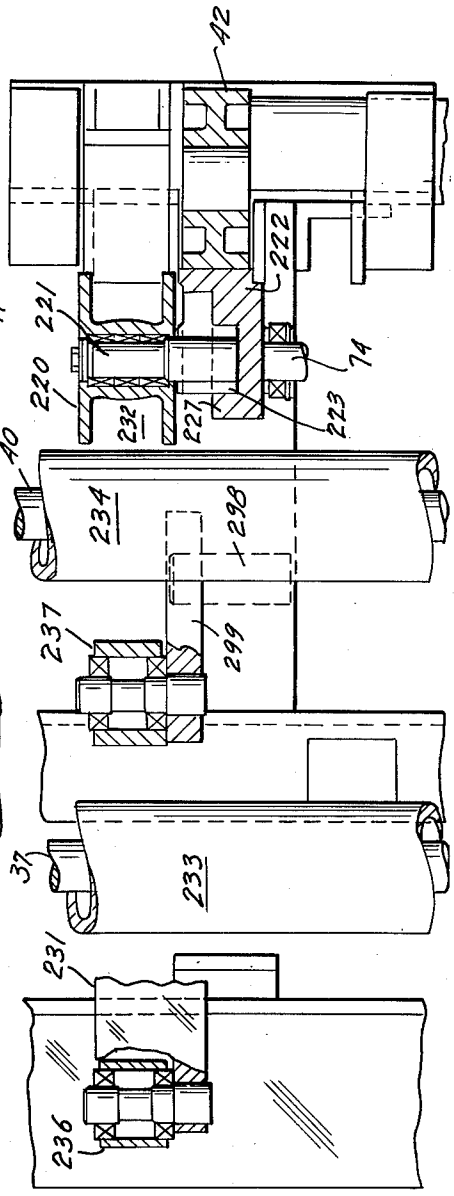

FIG. 4.

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3,203,561

LIFT CAM FOR STACKING DEVICE

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Continuation of application Ser. No. 87,870, Feb. 8, 1961. This application Apr. 16, 1964, Ser. No. 360,221
19 Claims. (Cl. 214—6)

This application is a continuation of copending application Serial No. 87,870 filed February 8, 1961, now abandoned. The instant invention relates to paper box making machinery in general and more particularly to a stacking, straightening and delivery section thereof which includes novel lifting means, novel straightening means and novel means for holding back the portion of the stack not being delivered.

In my copending U.S. application Serial No. 812,703, filed May 12, 1959 now U.S. Patent No. 3,063,577 issued November 13, 1962, entitled Counting Means, there is disclosed a stacking, straightening and delivery device which includes vertically moving belts for lifting and straightening and screw means for assisting in the lifting operation, as well as a spring-like means to hold back the portion of the stack not being delivered.

It has been found that the pressure applied by the moving belts to the leading and trailing edge of the blanks is especially effective for aligning the panels of a blank constructed of relatively stiff board. However, when the blanks are constructed of relatively light-weight board and the panels are badly misaligned, it has been found that the gradual pressure applied by the belts causes bending rather than straightening of the panels. It is most important that alignment of the panels be accurate or else the slot gaps will not be properly positioned so that automatic case sealers will be caused to jam.

In order to overcome this difficulty, the instant invention provides a slapper bar which engages the trailing edge of each folded blank as it enters the area between the moving belts. The slapper applies a hammer-like blow to the blank. It has been found that this is most effective in straightening badly misaligned panels of blanks constructed of relatively light material.

For boxes having a one-to-one ratio, the score line of the folded over panel is aligned above the score line of the non-folded panel below. With this condition present there is a pronounced tendency for the folded blank to sag at the center thereof.

In extreme cases this sag has been known to interfere with the entrance of the side edges of the folded blank into the appropriate thread space of the lifting screws, so that an accurate count is not obtained. Further, the sag has been known to adversely affect the formation of a well cemented joint at the glue flap.

In order to overcome this difficulty the device of the instant invention is provided with a cam-operated roller which is positioned at the center line of the machine and provides a lifting force for each of the folded blanks as they enter the area between the lifting belts. The cam is so constructed that the roller is moved out of the path of the blank until such time as a portion of the blank has passed above the roller. Thereafter, the roller rises and lifts the blank, especially at the trailing edge thereof. This assists in guiding the blank to the proper space between threads of the lifting screws and also serves to support the center of the folded blank to prevent sagging thereof. In addition, the action of the cam-operated roller in lifting the folded blank facilitates the engagement of the blank trailing edge by the rear lifting belt and slapper bar.

In the device of my aforesaid U.S. Patent No. 3,063,577,

a pusher device is provided which periodically engages the top portion of the stack to remove same while the stack is increasing in size, being fed from below. A spring-like means is provided at the forward edge of the stack to hold back the bottom portion of the stack while the top portion thereof is being removed.

It has been found that quite often an undue amount of rubbing takes place between the bottom blank of the portion being removed and the top blank of the remaining portion. In extreme cases this rubbing has been known to damage the printed matter contained on the folded boxes. More often the drag which accompanies this rubbing renders the spring means ineffective to hold back the bottom portion of the stack, so that the portion of the stack being delivered will have too many blanks and the following portion delivered will not have a sufficient number of blanks.

In order to overcome this difficulty the instant invention provides a set of idler rolls positioned forwardly of the stack and disposed so as to engage the bottom blank of the stack portion shortly after the delivery process begins. These rolls are arranged to lift the portion of the stack being delivered so as to reduce the rubbing forces previously described.

To hold back the bottom portion of the stack the device of this invention is also provided with a friction means in the form of resilient rolls. The resilient rolls are freely mounted upon axes extending parallel to the delivery path. The peripheral edges of the resilient rolls are tapered and are positioned so as to lightly engage the side edges of the topmost blank in the portion of the stack not being delivered.

The resilient rolls do not interfere with the upward movement of the blanks. However, forward movement of the blanks in the portion of the stack remaining during delivery is retarded so that the delivered portion contains a precise number of folded boxes.

Accordingly, a primary object of this invention is to provide a novel construction for a box stacking, straightening and delivery device.

Another object is to provide novel means to prevent sagging of the blanks as they are being accumulated and to guide the blanks as they enter the accumulating device so that straightening is facilitated and an accurate count is obtained.

Still another object is to provide novel means for the aligning of panels in a folded tubular box, whether the material thereof is relatively soft or hard.

A further object is to provide novel means for reducing the pressure between the portion of the stack being delivered and the remaining portion of the stack.

A still further object is to provide novel means for holding back the portion of the stack not being delivered.

These as well as other objects of this invention shall become readily apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 is a side elevation in schematic form of a stacking, straightening and delivery device constructed in accordance with the teachings of the instant invention.

FIGURE 2 is a fragmentary end view of the device of FIGURE 1 illustrating the manner in which motion of the cam-operated roll is coordinated with the operation of the lifting screws.

FIGURE 3 is a fragmentary side elevation illustrating the manner in which drive is imparted to the cam-operated roll.

FIGURE 4 is a plan view of the elements illustrated in FIGURE 3.

FIGURE 5 is a fragmentary perspective illustrating the manner in which the movement of the slapper bar is guided.

FIGURE 6 is a cross-section of one of the resilient

rolls utilized for holding back the portion of the stack not being delivered.

Now referring to the figures, driving power is supplied to the mechanism illustrated in FIGURE 1 by cross shaft **202** which is driven through mated bevel gears **301, 302** by line shaft **303** connected to the drive of all the other machine units of the preceding mechanism **11**, such as a folding and gluing machine. Cross shaft **202** carries sprocket **304** which drives chain **305**. Chain **305** passes below sprocket **304** to the right over the top of sprocket **19**, below sprockets **67** keyed to shaft **74**, below sprocket **27**, upwardly and to the right over sprocket **43***a*, then over and to the left of sprocket **304**. Thus, chain **305** drives conveyor belt **39**.

Belt **39** is generally horizontal in the region between pulley **38** and a pulley freely mounted on shaft **40**. After passing over the last recited pulley, belt **39** takes a pronounced dip passing beneath idler **41** and thence upwardly over pulley **42**. Belt **39** is also generally horizontal in the region between pulleys **42** and **43** and slightly raised above the other horizontal portion. Thereafter, belt **39** passes downwardly and to the right of pulley **43** below idler **44** and below and to the left of pulley **38**.

Sprocket **16** is keyed to the same shaft as sprocket **37** and drives chain **18** which passes upward and to the right over idler **25**, to the left and below idler **24**, upward and over drive sprocket **22**, downward to the right of idler **21**, below sprocket **40** to the left thereof, upwardly and over drive sprocket **20**, downwardly to the left and below sprocket **237**, thence to the right below sprocket **16**.

Suitable gearing (not shown) connects cross shaft **202** to shaft **310** having sprocket **311** keyed thereto. Chain **47** is driven by sprocket **311** and in turn drives sprocket **31** which is keyed to the same shaft as feed roller **66**. Chain **47** passes beneath sprockets **31, 311** and upwardly therefrom to supply driving power to variable speed drive unit **50**. Unit **50** in turn supplies the driving power to the delivery mechanism **51**, as fully explained in my copending U.S. application 645,801, filed March 13, 1957, now U.S. Patent No. 2,963,177 issued December 6, 1960, entitled Blank Stacking, Straightening and Delivery Device.

The rotation of sprockets **20, 22** causes rotation of shafts **52, 53**, respectively, having the respective sprocket means **54, 55** keyed thereto. The rotation of sprocket means **54, 55** imparts motion to stacking belt means **56, 57**, whose working faces engage the trailing and leading edges of the blanks forming stack **58** to impart upward movement thereto. The region between belt means **56, 57** is designated as the stacking region, since the folded tubular boxes **68**, after moving horizontally on conveyor **39**, have the horizontal motion thereof arrested and changed to a vertical upward movement whereby stack **58** is formed. Straightening of boxes **68** occurs in the stacking region since the upwardly moving flights of belt means **56, 57** converge slightly from the top to the bottom, as explained in my aforesaid copending application 645,801.

Periodically, pusher device **59**, as it moves from left to right (with respect to FIGURE 1) in a lowered position, engages the top portion of stack **58** so as to remove a pile of blanks **60** therefrom. Chains **61, 62** driven by variable speed drive **50** through chain **63**, impart oscillatory motion to pusher means **59** whereby it moves from left to right in a lowered position and from right to left in a raised position, as fully explained in my aforesaid copending application 645,801.

In order to insure that the number of folded tubular boxes **68** comprising pile **60** will be of a predetermined number, the mechanism includes screws **72, 73**, which are continuously driven by means of sprocket **67**. Sprocket **67** (FIGURE 2) is keyed to transverse shaft **74**, having bevelled gears **75, 76** keyed thereto, driving bevelled gears **77, 78**, respectively, which are keyed to screws **72, 73**, respectively, at the lower ends thereof. Thus, the rotation of transverse shaft **74** causes screws **72, 73** to rotate in unison.

The lower ends of screws **72, 73** are journaled by bearings **79, 78**, respectively, which are mounted within brackets **81, 82**, respectively, extending inwardly from transversely adjustable frame members **83, 84** respectively. The upper ends of screws **72, 73** are journaled in suitable bearings carried by brackets extending inwardly from frame members **83, 84**, respectively.

As is apparent from FIGURE 2, the threads which occupy a majority of the length of each of the screws **72, 73** are of a uniform pitch B. However, at their lower ends, below slapper plate **200**, at least one thread of each screw **72, 73** is opened out to a pitch C, which is considerably larger than pitch B. Similarly the upper (preferably the top two) threads of screws **72** and **73** are opened out to a pitch A somewhat larger than pitch B in order to obtain a cleaner push off of stack **60**.

To meet special squaring requirements on thinner sheet material the threads in the region of the slapper plate are made closer together, having a pitch D which is less than pitch B. In a typical machine thread pitches A–D equal 1″, ⅝″, 3″ and ⅜″, respectively.

As a blank **68** is fed from mechanism **11** to the right, blank **68** is engaged by upper pressure roller **66**, which is keyed to a common shaft with sprocket **31**. The cooperation of roller **66** and conveyor belt **39** moves blank **68** to the right through the space formed between the lower edge of slapper plate **200** and conveyor **39**, with the side edges **90, 91** of blank **68** thereafter entering the spaces between the threads of wide pitch C. Screws **72, 73** are rotated in such a direction that the threads thereof will impart a lifting action to blanks **68** as they enter the stacking region even before the leading and trailing edges thereof are engaged by the upwardly moving flights **57, 56**.

As blanks **68** move upwardly in stack **58**, they are substantially equally spaced apart by the thread pitch distance B. Because of this a predetermined number of blanks will move past the top of lift screws **72, 73** in a given time, so that pusher means **59** will always remove a pile **60** containing a predetermined number of blanks **68**. When reference is made to a region above the top of the lift screws, this refers to the region above the top of the screw threads.

Pusher plate **65** (FIGURE 1) has pivotally mounted thereto peripherally grooved wheels **64** whose grooves receive the longitudinal edges of support plate **69**. Because of this, pusher plate **65** may move vertically relative to support plate **69**. Ears **70**, extending outwardly from support plate **69** at the bottom thereof, limit the downward movement of pusher plate **65**. Aligned slots (not shown) in support plate **69** and pusher plate **65** provide a clearance opening for flexible hold-down strips **110, 111**, which apply a downward pressure to stack **58**, even when pile **60** is being removed therefrom.

As explained in my aforesaid copending application 645,801, the flexible front guide means comprising flexible strips **121–123**, secured to the frame of the machine, is positioned at the leading edge of stack **58** at approximately the level of the top of lift screws **72, 73**. Front guide means **121–123** acts to hold back the portion of stack **58** not being removed by pusher plate **65**.

In order to improve the panel alignment process carried out by belt means **56, 57**, especially when the blanks are comprised of relatively soft board, a reciprocated slapper plate **200** is provided. Slapper plate **200** extends transversely across conveyor belt **39**, slightly above the horizontal portion thereof between pulley **38** and the pulley on shaft **40** and substantially on a level with the horizontal portion of conveyor **39** between pulleys **42, 43**.

Eccentrics **201** are keyed to shaft **202** which is driven by bevel gear **301**. Each of the eccentrics **201** drives an individual block **203** disposed on opposite sides of con-

veyor 39. Each of the blocks 203 carries parallel spaced arms 204, 205, which extend upwardly and forwardly to blocks 206. Crossbar 207 (FIGURE 5) interconnects blocks 206 and fasteners 208 secure slapper plate 200 to crossbar 207.

Movement of slapper plate 200 relative to frame 210 is guided by means of rollers 211, 212. Roller 212 is mounted to a horizontal stub shaft 213 extending from frame member 210. Roller 212 is disposed between bearing plates 214, 215 secured to arm 204 and crossbar 207, respectively. Roller 211 is mounted to vertical stub shaft 216 extending upwardly from crossbar 207 and is operatively positioned in engagement with bearing plate 217 mounted to frame member 210. Thus, roller 212 guides the reciprocating horizontal movement of slapper plate 200 along the feed path of blanks 68 while roller 211 prevents transverse movement of slapper plate 200.

As best seen in FIGURE 1, the slapper plate 200 applies hammerlike blows to the trailing edges of blanks 68 prior to the engagement thereof by rear stacking belt means 56. The abrupt engagement of blanks 68 by slapper plate 200 is effective for aligning the panels thereof, especially when blanks 68 are constructed of relatively soft board.

Cam-operated roller 220 is provided in order to prevent sagging of blanks 68 in the center region thereof, to facilitate entry of the side edges thereof between the appropriate threads of screws 72, 73, and also to facilitate engagement of the trailing edges of blanks 68 by rear belt means 56. Roller 220 is pivotally mounted on stub shaft 221 (FIGURES 2, 3) carried by vertical portion 223 positioned at the rear of bracket 222 while the forward portion 224 of bracket 222 is pivoted at 225 to the frame of the mechanism. The rear portion 223 also carries cam follower 226 which is biased into engagement with cam 227 by spring 228. Spring 228 is a tension member secured at one end to frame bracket 229 and at the other end to the rear of pivoted bracket 222.

Cam 227 is keyed to shaft 74 which provides the driving power for lifting screws 72, 73. With this arrangement it is seen that roller 220 is provided with an oscillatory motion with each oscillation corresponding to one revolution of lifting screws 72, 73.

Cam 227 is so shaped that the oscillatory motion of roller 220 includes a quick fall-off so that roller 220 is in its lowermost position preparatory to engaging blanks 68 as they move into the stacking region. As each blank moves into the stacking region, roller 220 applies a gradual lifting motion to the blanks 68, so that by the time the rear ends thereof are engaged by roller 220, roller 220 is in its uppermost position and the trailing edges of the blanks have been engaged by slapper plate 200. Thereafter rear belt means 56 engages the trailing edges of the blanks.

During movement of the blanks 68 into the stacking region, roller 220 is not only vertically oscillated but is also driven rotatively about its shaft 221. This is accomplished by means of belt 231, which is disposed within the central groove 232 of roller 220. Belt 231 is driven by drive pulley 233, which is keyed to driven shaft 37. Rollers 234–236 together with tension roller 237 also define the path of belt 231. Roller 237 is freely mounted to adjusting arm 299 which is secured to the mechanism frame at pivot 298 by suitable clamp means (not shown). The motion of belt 231 is such that roller 220 is rotated in the clockwise direction indicated by arrow E in FIGURE 3, so that blanks 68, upon being engaged by roller 220, are driven forward thereby.

During the removal of pile 60 by pusher plate 65, it is essential that the remaining portion of stack 58 be held back. As previously explained, flexible strips 121–123 are provided for this purpose. However, it has been found that the resistance offered by strips 121–123 is not always sufficient for this purpose. Therefore, friction roller means 250 (FIGURES 1, 2, 6) are provided on opposite sides of the mechanism. Each of the friction roller means 250 is mounted to frame support 251 on stub shaft 252 extending parallel to the horizontal feedpath of blanks 68, being freely mounted thereon at bearing 253. Supports 251 are horizontally positionable with respect to frame members 83, 84 through the cooperation of pins 251*a* entered into elongated slots 252*a*. Means (not shown) operable by levers 253*a* are provided to lock supports 251 in their adjusted positions. Handwheels 254*a* operate means for locking supports 251 in adjusted vertical position.

Friction roller means 250 is provided with a peripheral edge portion 254 which is constructed of material having the mechanical properties of rubber. It is to be noted that the peripheral edge of roller means 250 is tapered so that the most forward portion 255 is closer to the sides of stack 58 than is the most rear portion 256 of roller means 250.

Roller means 250 are so positioned that the side edges of blanks 68 are lightly engaged as these blanks move upwardly in stack 58. As pusher plate 65 begins to move pile 60, the topmost blank 68, in the portion of stack 58 remaining at the stacking region, is engaged by the friction roller means, which exerts a force thereon opposing forward movement of this blank. However, the resilient nature of roller means portion 254 and the rotatable mounting thereof does not interfere with the continued build-up of stack 58.

Delivery is further facilitated by roller means 270 (FIGURE 1) freely mounted to the mechanism frame at shaft 271. Roller means 270 is positioned so that the top thereof extends slightly above the tops of lift screws 72, 73. As the delivery of pile 60 begins, the leading edge thereof contacts roller means 270. This causes the weight of pile 60 to be somewhat removed from the portion of stack 58 remaining in the stacking region, thereby reducing drag between pile 60 and the portion of the stack 58 remaining in the stacking region as stack 58 is transferred to horizontal conveyor 278.

Thus, this invention provides improvements in a stacking, straightening the delivery device, including a cam-operated lifting roller to prevent sagging of the blanks, a reciprocated slapper plate for the alignment of panels in blanks constructed of relatively soft board, a friction roller means for holding back the portion of the stack not being delivered, and a roller means operatively positioned to support the portion of the stack being delivered, so as to reduce drag on the portion of the stack not being delivered.

Although there has been described preferred embodiments of this invention, many variations and modifications will now be evident to those skilled in the art and, therefore, the scope of this invention is to be limited not by the specific disclosure herein detailed, but only by the appended claims.

I claim:

1. A stacking, straightening and delivery mechanism adapted for use with a machine for operating on box blanks; said mechanism comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position; an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof; said accumulating device including a first and a second means operatively positioned at a stacking region to engage the leading and trailing edges, respectively, of said blanks and imparting upward movement thereto, and vertically oscillatable means disposed adjacent said stacking region in operative position for engaging the intermediate portion and trailing edge of each of the blanks from below between the side edges thereof and lifting the blank as it enters the stacking region.

2. A stacking, straightening and delivery mechanism adapted for use with a machine for operating on box blanks; said mechanism comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position; an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof; said accumulating device including a first and a second means operatively positioned at a stacking region to engage the leading and trailing edges, respectively, of said blanks and imparting upward movement thereto, and vertically oscillatable means disposed adjacent said stacking region in operative position for engaging the intermediate portion and trailing edge of each the blanks from below between the side edges thereof and lifting the said blank as it enters the stacking region; said oscillatable means comprising a cam operated device.

3. The mechanism as set forth in claim 2 including means for operating the cam operated device through an integral number of cycles for each blank received by the mechanism.

4. The mechanism as set forth in claim 2 in which the cam operated device includes a roller which engages the blanks from below; and means for driving said roller in a direction to assist the blanks in their forward movement.

5. In a stacking, straightening and delivering mechanism adapted for use with a machine for operating on box blanks, comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position and an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof, the improvement comprising a vertically oscillatable means disposed adjacent the stacking region in operative position for engaging the intermediate portion and trailing edge of each of the blanks from below between the side edges thereof and lifting each said blank as it enters the stacking region, and a reciprocable means disposed adjacent said stacking region in operative position for engaging the lowermost blanks in the stack at the trailing edges thereof and applying a force to said blanks directed toward the leading edges thereof.

6. The mechanism as set forth in claim 5 including means for operating the reciprocated means through an integral number of cycles for each blank received by the mechanism.

7. The mechanism as set forth in claim 5 in which the oscillatable means includes a cam operated device, and means for operating the cam operated device through an integral number of cycles for each blank received by the mechanism.

8. The mechanism as set forth in claim 5 in which the intercepting and accumulating device includes a set of vertically extending screw means positioned to receive the side edges of the blanks in the spaces between screw threads, means for rotating said screw means in a direction to raise the blanks, said oscillatable means including a cam operated device including a roller which engages the blanks from below, and means for driving said roller in a direction to assist the blanks in their forward movement.

9. The mechanism as set forth in claim 5 in which the intercepting and accumulating device includes a set of vertically extending screw means positioned to receive the side edges of the blanks in the spaces between screw threads, and means for rotating said screw means in a direction to raise the blanks.

10. The mechanism as set forth in claim 9 in which the screw means is provided with an enlarged thread pitch at a first region at the lower end of said screw means to facilitate engagement of blanks by said screw means.

11. The mechanism as set forth in claim 10 in which there is a second region of said screw means at the upper end thereof; said second region having a thread pitch which is larger than the thread pitch between said first and said second regions to facilitate removal of the top of the stack.

12. A stacking, straightening and delivery mechanism adapted for use with a machine for operating on box blanks; said mechanism comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position; an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof; said accumulating device including a first and a second means operatively positioned at a stacking region for engaging said blanks and imparting an upward movement thereto; pusher means positioned above said stacking region for periodically engaging the stack and removing the top portion of the stack; friction means in engagement with the side edges of at least the topmost blank in the remaining portion of the stack for holding the remaining portion back during removal of the top portion, said friction means operating without interfering with the upward movement of said blanks in said stacking region; said friction means comprising rollers mounted upon horizontal axes extending substantially parallel to the direction of motion of the top portion during removal thereof.

13. The mechanism as set forth in claim 12 in which the rollers each have a peripheral edge region which is constructed of resilient material and is tapered.

14. The mechanism as set forth in claim 13 in which the rollers each have a peripheral edge region which is constructed of resilient material and is tapered, with the rollers arranged so that the outwardly tapered portion of the peripheral edge closest to the trailing edges of the blanks is most remote from the trailing edges of the blanks.

15. The mechanism as set forth in claim 13 further including means for vertical and horizontal adjustment of said rollers.

16. A stacking, straightening and delivery mechanism adapted for use with a machine for operating on box blanks; said mechanism comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position; an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof; said accumulating device including a first and a second means operatively positioned at a stacking region to engage the leading and trailing edges, respectively, of said blanks and imparting upward movement thereto, and vertically oscillatable means disposed adjacent said stacking region in operative position for engaging the intermediate portion and trailing edge of each of the blanks from below between the side edges thereof and lifting the said blank as it enters the stacking region; a reciprocated means disposed at said stacking region in operative position for engagement with the lowermost blanks in the stack at the trailing edges thereof and thereby applying a force thereto directed toward the second means.

17. A stacking, straightening and delivery mechanism adapted for use with a machine for operating on box blanks; said mechanism comprising a horizontal conveyor operable in synchronism with said machine to receive blanks issuing therefrom in a flat position; an intercepting and accumulating device operatively positioned above said conveyor to form said blanks into a stack which is fed from the bottom thereof; said accumulating device including a first and a second means operatively positioned at a stacking region to engage the leading and trailing edges, respectively, of said blanks and imparting upward movement thereto, vertically oscillatable means disposed adjacent said stacking region in operative position for engaging the intermediate portion and trailing edge of each

of the blanks from below between the side edges thereof and lifting the said blank as it enters the stacking region; a set of vertically extending screw means positioned to receive the side edges of the blanks in the spaces between screw threads; means for rotating said screw means in a direction to raise the blanks; said screw means having an enlarged thread pitch at a first region at the lower end of said screw means.

18. The mechanism as set forth in claim **17** in which there is a second region of said screw means, at its upper end, having a thread pitch which is larger than the thread pitch between the first and second regions to facilitate removal of the top of the stack.

19. The mechanism as set forth in claim **17** also comprising a reciprocated means disposed at the stacking region in operative position for engagement with the lower-

most blanks in the stack at the trailing edges thereof and thereby applying a force thereto directed toward the second means; said screw means having a reduced thread pitch in a second region thereof operatively positioned above said first region to raise the blanks while they are engaged by the reciprocated means; said screw means having an extensive third region above said second region with a larger thread pitch than that of the second region.

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HUGO O. SCHULZ, *Primary Examiner.*