

Dec. 29, 1953

L. W. ROSELIUS

2,664,035

SLITTING, SCORING AND FOLDING MACHINE

Filed June 5, 1951

6 Sheets-Sheet 1

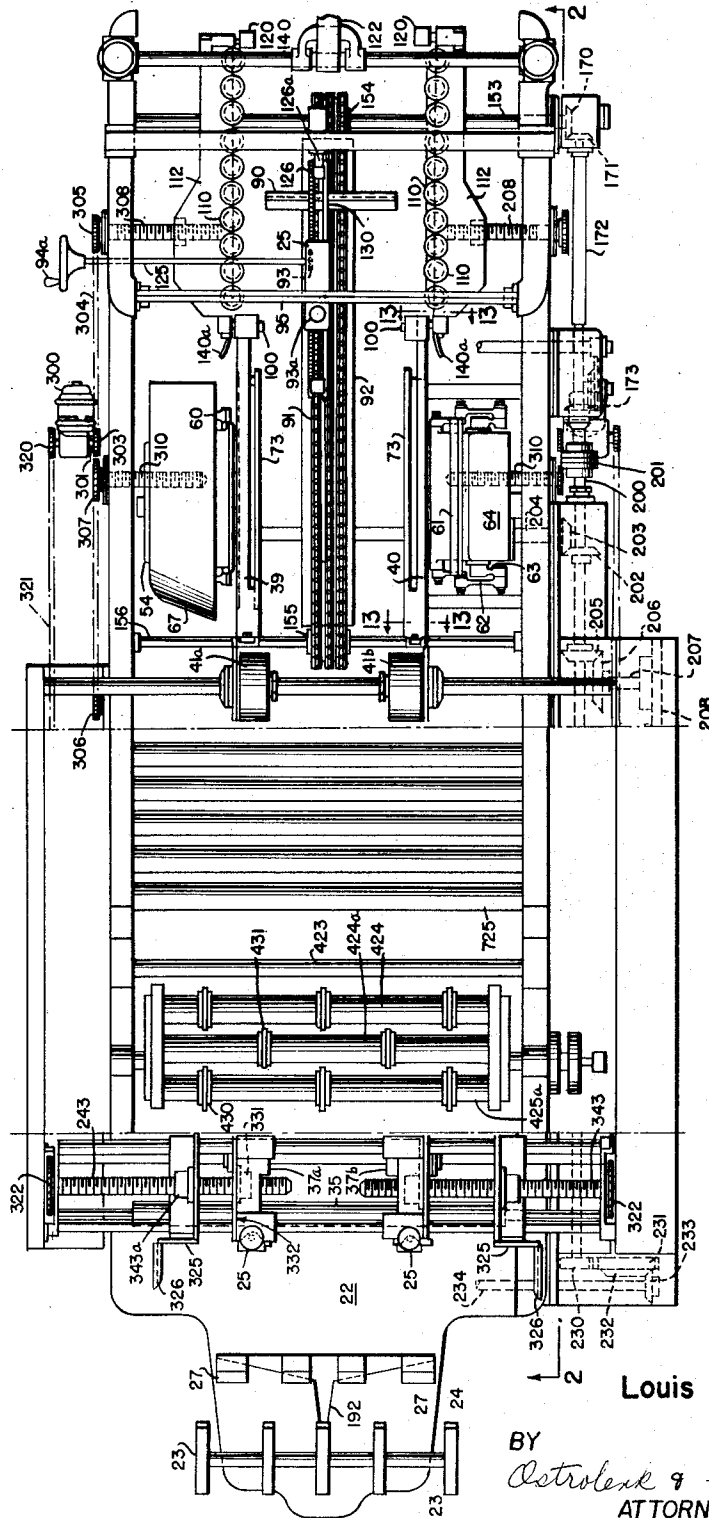


FIG. 1.

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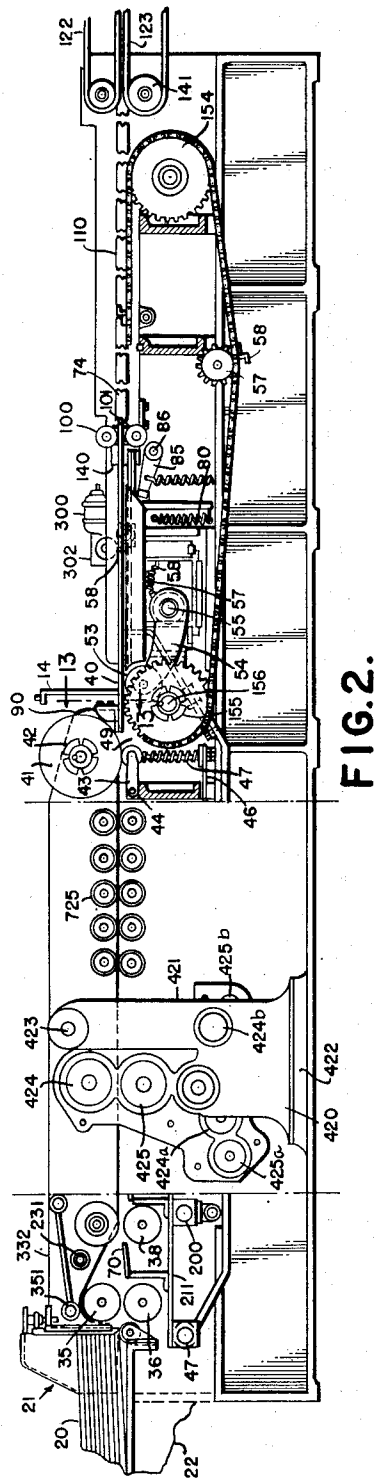
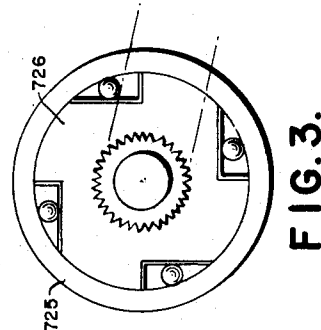
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SLITTING, SCORING AND FOLDING MACHINE

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6 Sheets-Sheet 2



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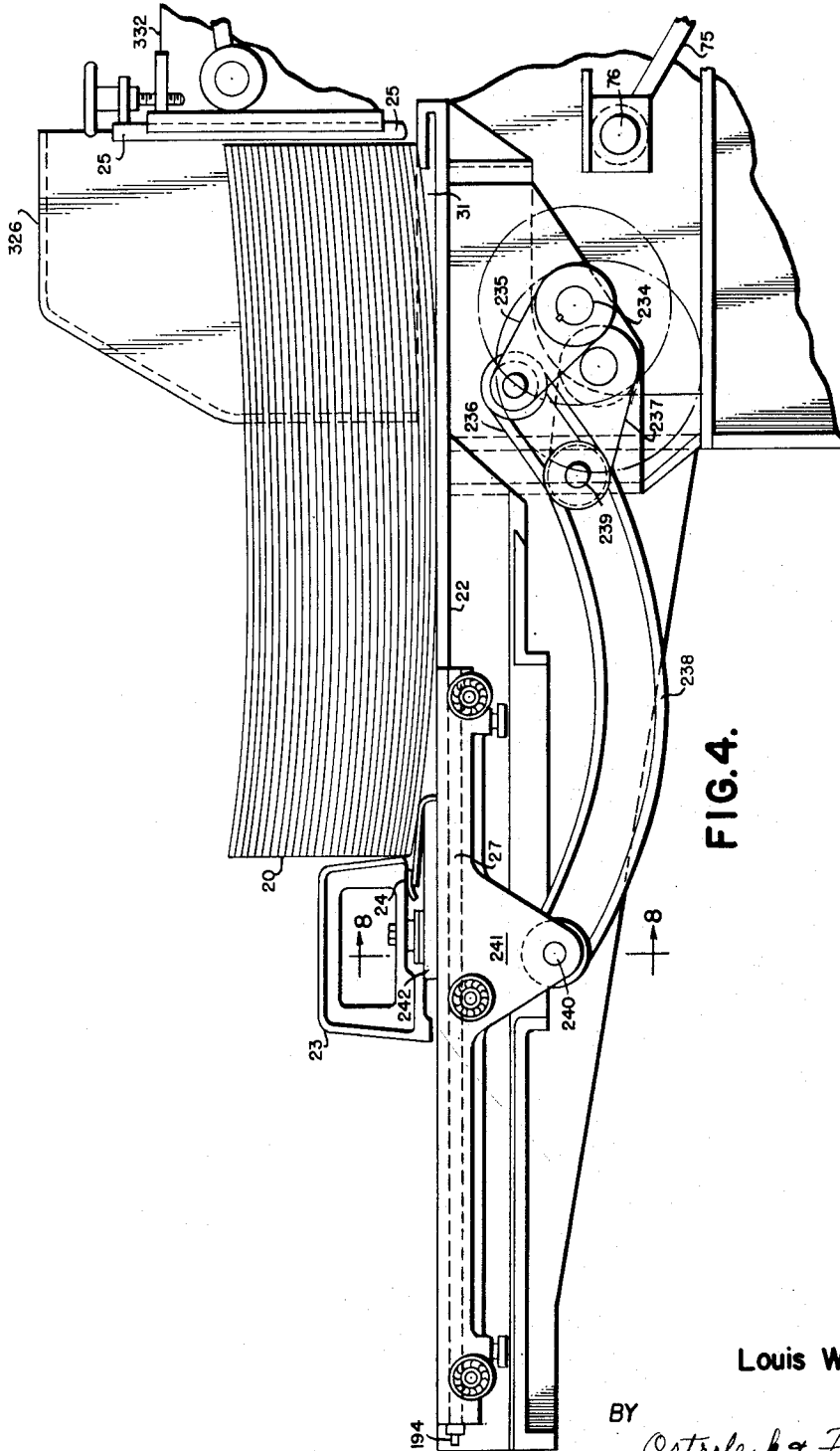
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SLITTING, SCORING AND FOLDING MACHINE

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6 Sheets-Sheet 3



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SLITTING, SCORING AND FOLDING MACHINE

Filed June 5, 1951

6 Sheets-Sheet 4

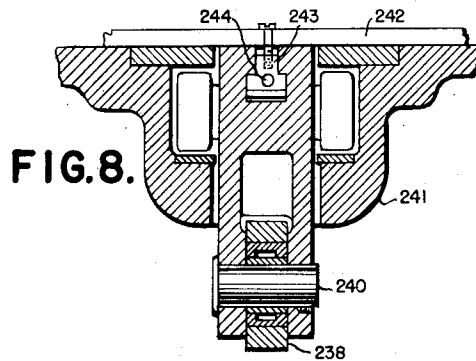


FIG. 8.

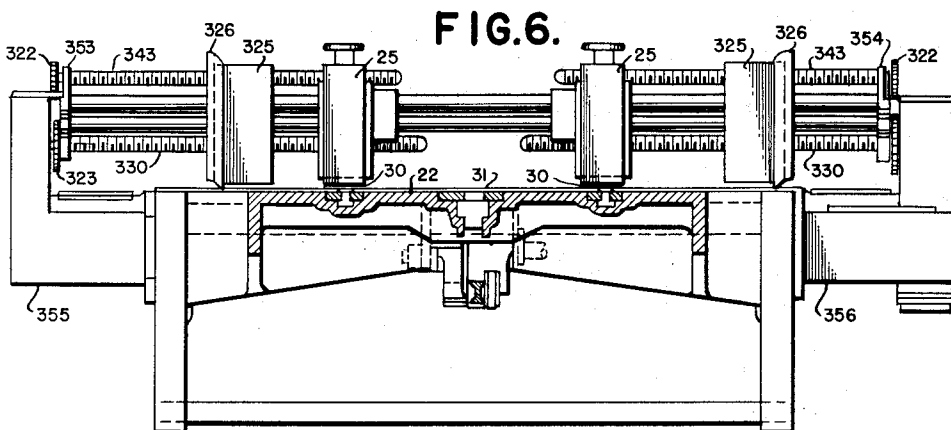


FIG. 6.

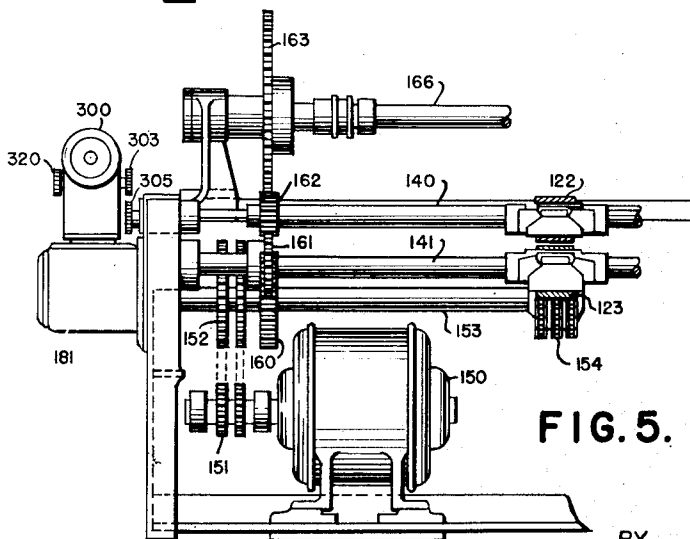


FIG. 5.

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SLITTING, SCORING AND FOLDING MACHINE

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6 Sheets-Sheet 5

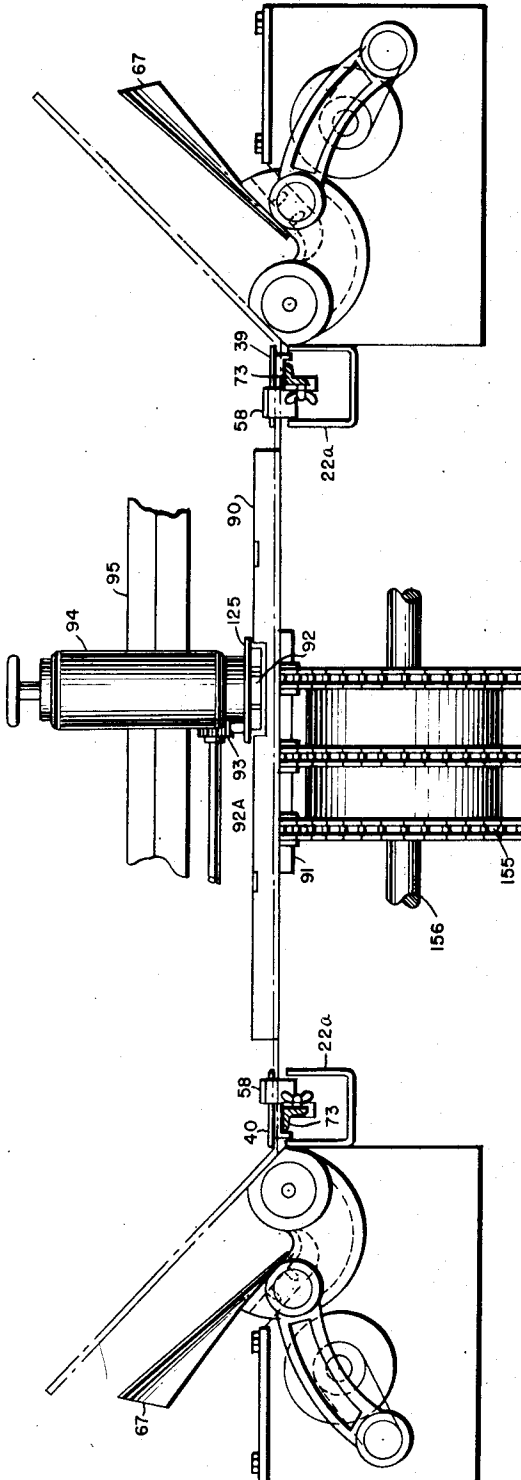


FIG. 7.

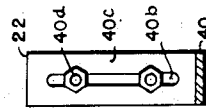


FIG. 13.

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SLITTING, SCORING AND FOLDING MACHINE

Filed June 5, 1951

6 Sheets-Sheet 6

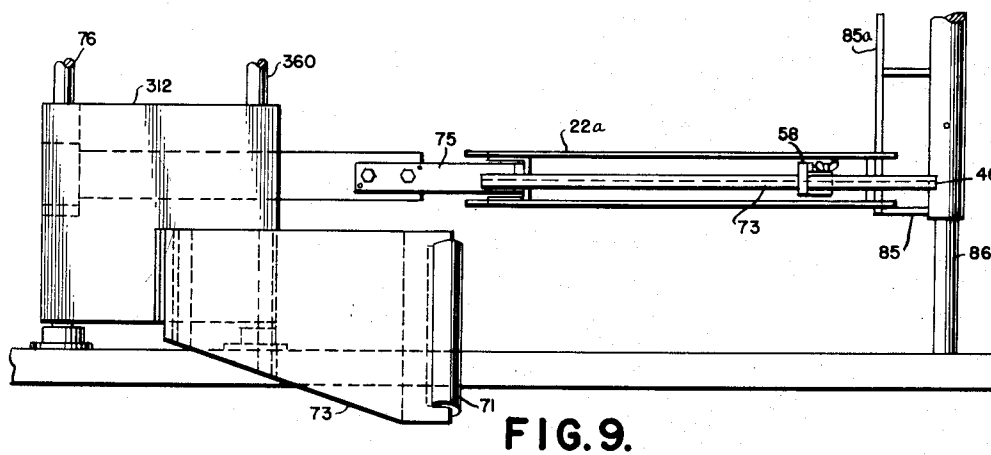


FIG. 9.

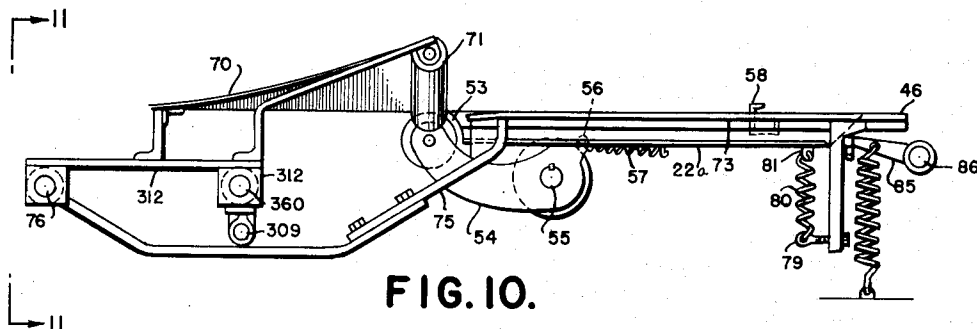


FIG. 10.

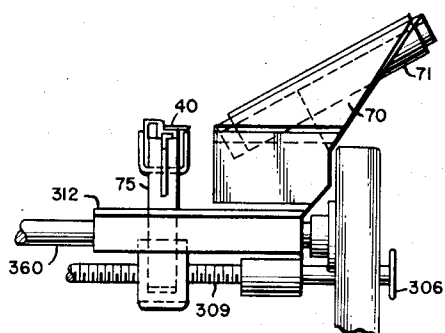


FIG. 11.

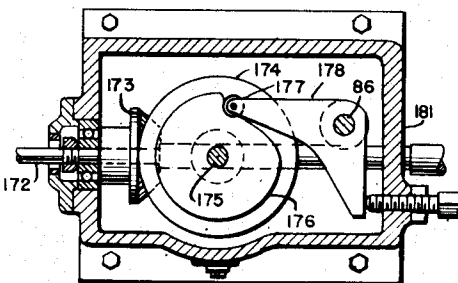


FIG. 12.

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UNITED STATES PATENT OFFICE

2,664,035

SLITTING, SCORING, AND FOLDING
MACHINE

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Brooklyn, N. Y., a corporation of New York

Application June 5, 1951, Serial No. 229,933

5 Claims. (Cl. 93—49)

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My present invention relates to a paper folding machine and more particularly to machines for forming corrugated or other fibreboard blanks into completed tubular boxes.

Heretofore in the operation of forming a piece of corrugated board or other type of fibrous material into a box, it has been necessary first to trim, score and cut out six slots in the blank to provide the appropriate score lines as well as the appropriate slots, the score lines defining the various walls and flaps and the slots separating the flaps from each other in order to enable the flaps to be formed into a closure after the box is made.

After the slitting and scoring operation, the blanks have usually been stacked and delivered by appropriate means to a folding and taping unit. The folding and taping unit has consisted either of a simple taping machine fed by an operator who first folded each blank before feeding the same into the taping machine or the folding unit comprised an automatic feed device on which the slit and scored blanks were stacked, the feed device moving the blanks successively into the folding machine which bent the panels over in order to form the blank into a collapsed tubular box; and a taping or stitching machine was then mounted at the end of the folding machine in order to complete the operation.

This has required separate units with separate feeding devices and separate sets of operators, thereby duplicating many of the operations and requiring an additional transporting or conveying operation between the slitting and scoring machine and the folding machine.

My invention is directed to the completion of the slitting and scoring operation and the folding operation in a single unit whereby a single stacking operation for the blanks and a single feeder will feed the blanks first into the slitting and scoring mechanism which will form the blank in such manner that it may readily be folded and thereafter the blank as it is fed out from the slitting and scoring mechanism will be picked up and fed directly to the folding plates in order to form the collapsed tubular box blank.

By this means, therefore, the separate feeding device and the transporting problem entailed in the removal of blanks from the slitter scorer and the placement thereof in the folding machine will be obviated, the entire operation being done mechanically in a single unitary machine at one end of which a pile of plain blanks will be placed on a stack and at the other end of which collapsed completed tubular box members will be delivered.

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Actually, the process of making boxes may itself be revolutionized by this type of operation.

In the ordinary manufacture, particularly of double face corrugated board, it is customary to place a slitter and scorer in the path of the finished corrugated board as it comes from the machine so that the slitter and scorer will place the necessary creases, scores and slots in the blank without the necessity for a separate feeding operation.

It has also been thought that thereafter the blanks must be taken through a separate folding and taping machine.

In my invention the entire corrugated board assembly and manufacturing line may be so arranged that the craft paper from the three separate mill rolls is fed in continuous web form at one end of the machine and finished collapsed tubular box blanks are delivered at the other end of the machine without any manual operation being performed at any step along the way.

This is made possible by placing a standard cut-off of a well-known type in the path of the corrugated blank as is now known in the art and then placing my combined slitter, scorer and folder in the path of delivery from the cut-off so that all of the operations will be combined.

Thus, the primary object of my invention is the combination of a single unitary structure of a slitter, scorer and folder taper.

A further and important object of my invention is the arrangement of the delivery element of the slitter scorer portion of the mechanism so that it will act as a feed-in element of the folding mechanism of the combined device.

This particular aspect of the invention has presented the major problem thus far in the art which prevented the combination of a slitter scorer with a folder taper or folder stitcher or simple folding device.

The folding mechanisms require a particular type of feed-in operation which is not necessarily consistent with the delivery operation of a slitter scorer.

Thus, in folding mechanisms of the general type shown in Patent No. 2,336,507 and, in for instance, Patent No. 2,517,449 issued August 1, 1950, and Patent No. 2,583,712 issued January 29, 1952, the feed-in operation for the folding plates or folding elements which turn the outer panels of a creased and scored box blank into a collapsed tubular casing requires a high-speed roller drive which will move the blank rapidly against a stop in the folding mechanism.

This high-speed roller drive must be so ar-

ranged and positioned that the blank will leave the high-speed roller before it strikes the stop and thus in essence is thrown against the stop, enough friction being developed by the various portions of the mechanism, however, that the blank will not bounce back for any material distance from the stop.

Thereafter a slat on a feed chain is so timed that it will reach the rear end of the blank after the folding plates have completed their folding operation so that the collapsed tubular blank can be moved from the folding region.

Such a high-speed feed roller, however, for the blank will when the unit is combined with a slitter and scorer serve to draw the blank too rapidly through the slitter and scorer, thereby resulting in a tearing of the blank or a stalling or wrinkling of the blank which may eventually result in damage to the machine and at least a slowing down or interruption of the entire operation.

Thus, it becomes very important and it is an essential aspect of my invention that some means be provided for moving the blank from the slitter scorer elements to the folding plate elements of the combined machine while at the same time not interfering with either operation.

In order to solve this particular problem, my invention contemplates a plurality of driven feed rollers moving at the peripheral speed at which the paper is to move through the slitting and scoring mechanism. These will serve to draw the blank through the slitting and scoring mechanism in synchronism with the speed at which the feed slat for the slitting and scoring mechanism or the feed-in device for the slitting and scoring mechanism operates in order that a controlled regular speed is obtained for movement of the blank through the slitting and scoring mechanism, thereby resulting in the proper slitting and scoring operation for the blank.

In order to accomplish this result, the delivery rollers for the slitting and scoring mechanism or a portion of the feed-in system for the folding mechanism are so arranged that while these rollers are driven at the peripheral speed to match the speed of the blank through the slitting and scoring mechanism, they are driven in this manner by an overrunning clutch arrangement or other release arrangement which will permit the blank to be drawn between those rollers at a higher speed than the rollers themselves will move the blank.

The high-speed feed-in roller for the folding machine itself is adjustably positioned transversely of the machine but adjustable in a direction at right angles to its own axis and along the main axis of the machine.

This adjustable positioning of the high-speed feed-in roller for the folding mechanism is so arranged that the high-speed feed-in roller of the feeding mechanism will be reached by the forward or leading edge of the blank immediately after the trailing edge of the blank has left the slitting and scoring mechanism, thereby permitting the high-speed feed-in mechanism for the folding elements of the machine to operate at the necessary high speed for such a feed-in without interfering with the slitting and scoring operation.

The feed-out or delivery rollers for the slitting and scoring elements of the machine will serve to draw the blank through the slitting and scoring elements at the controlled speed until the high-speed roller is reached and thereafter the high-speed roller will be able to draw the blank

at the increased speed owing to the fact that the prior rollers are driven by an overrunning clutch or other releasable arrangement which will permit the blank to be drawn between them at a higher speed than the speed imparted to the blank by the rollers themselves.

While adjustability of the high-speed roller in the manner above-described is desirable, it is not essential since the feed-out or delivery rollers for the slitting and scoring elements may be so arranged that they are spaced apart less than the distance between the leading and trailing edge of the shortest blank with the high-speed feed-in roller for the folding machine being spaced from the slitting and scoring elements by a distance greater than the distance between the leading and trailing edge of the largest blank which may be used.

This may result in some delay during the initiation of the operation of forming collapsed tubular boxes from the blanks, but once the operation has been started it will be continuous and uninterrupted.

Thus, while the adjustability as above-described of the high-speed roller is extremely useful, it is not essential owing to the fact that the releasable driving rollers may be placed in any desired number between the slitting and scoring rolls and the high-speed feed-in mechanism for the folding elements.

Thus another and important object of my invention is the provision of novel blank moving elements between the slitting and scoring elements and the folding elements of the combined slitter scorer and folding machine in such manner that the blank may be carried from the slitting and scoring machine at a speed which will match the operation of the slitting and scoring elements while at the same time the blank is delivered into the folding elements at the higher speed necessary for proper operation of the folding elements.

The foregoing and many other objects of my invention will become apparent in the following description and drawings in which:

Figure 1 is a top plan view of my novel improved combined folding machine and slitting and scoring machine.

Figure 2 is a side view of the machine of Figure 1.

Figure 3 is an enlarged cross-section of an intermediate feed-in roll.

Figure 4 is an enlarged side view showing the stacking and feeding arrangement for the blanks which are to be fed into the combined slitting, scoring and folding machine.

Figure 5 is an end view of my novel combined slitting, scoring and folding machine taken from line 5—5 of Figure 2 looking in the direction of the arrows.

Figure 6 is a view partly in cross-section of the front gauge supports for the folding elements of the machine taken from line 6—6 of Figure 4 looking in the direction of the arrows.

Figure 7 is a cross-sectional view showing the manner in which the blank enters the region of the folding plates.

Figure 8 is a cross-sectional view taken on line 8—8 of Figure 4 looking in the direction of the arrows.

Figure 9 is an enlarged top plan view showing the arrangement of the pre-folding means for preparing the panels of the blanks for folding by the folding prints of my invention.

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Figure 10 is a side view of the pre-folding means of Figure 9.

Figure 11 is an end view of the pre-folding means and stop device taken from line 11—11 of Figure 10 looking in the direction of the arrows.

Figure 12 is a side view partly broken away taken on line 12—12 of Figure 1 showing the means for operating the stop device out of stopping position after the blank has been folded.

Figure 13 is a detailed view taken from line 13—13 of Figures 1 and 3 showing the adjustment of the folding bars.

The folding elements of the mechanism are connected to the slitter and scoring rolls by feed rollers 725 each driven by an overrunning clutch drive 726 (Figures 2 and 3) to draw the blank at the peripheral speed of the slitting and scoring rollers and deliver the blank to the high-speed feed-in roll for the folder.

The blanks are then fed between the upper and lower feed rolls 41, 42. Upper feed roll 41 actually consists of two feed rolls 41a and 41b occupying the same position, respectively, as feed rolls 37a and 37b as shown in Figure 1 and simultaneously adjustable with said feed rolls. The feed roll 42 on the underside is a single roll extending entirely across the machine and is rotatably mounted between the levers 43 which in turn are rotatably mounted on the pins 44 on opposite sides of the machine carried on lugs of the cross-bracket 45. The lower end of cross-bracket 45 has secured thereto arm 46 having an opening through which the spring guide rod 47 passes (all of the foregoing may readily be seen in Figure 3). Compression spring 43 around the guide rod 47 bears between washer 49 on the underside of lever 43 and washer 50 on the upper side of arm 46 and thus biases lever arm 43 upwardly to bias the idling roll 42 upwardly to tightly press the blank against the upper feed roll 41.

The maximum lift of lever 43 and thus the maximum rise of idling roll 42 may be controlled by the adjustable nuts 51 on the lower end of the guide rod 47.

Rolls 35 and 36 are also spring biased in a manner similar to the springing means described for roll 42.

The blank is then carried under the folding bars 39 and 40 and over the feed rolls 53 (see also Figure 10) which are rotatably mounted on each side on arms 54 rotatably supported on a center coaxial with shaft 55.

The feed rolls 53 are provided with standard overrunning clutch arrangement. Rolls 53 will feed the blank at the speed of the chain hereinafter described when driven by their drive members also hereinafter described.

The overrunning clutch arrangement, however, permits the feed-out rolls in front of the stacking device to feed out the blank at higher speed into the folding mechanism without initial interference from the slower moving rolls 53. These rolls 53, because of the overrunning clutch arrangement, will rotate faster at the speed of the blank as it is fed out; but will drive the blank after it is fed out at a slower speed against the stop hereinafter described. The slower speed prevents marring of the front edges of the blank.

Each of the arms 54 has an extension 56 on the opposite side of the shaft 55 connected to tension spring 57, which in turn is connected to a stationary lug 58 (Figures 3 and 10). The spring 57 biases the feed rolls 53 upwardly to

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engage and drive the blank. The feed rolls 53 engage the blank on each side by pressing it up against the folding bars 39 and 40 and thus carry the blank forward until its front edge engages the stops 58 mounted on stop bars 73. The forward progress of the blank is thus arrested while the feed rolls 53 continue to rotate and press the blank against the stops 58.

While the blank is in this position with its forward edge against the two stops 58, the creases or scores on which the fold is to take place are in register with the outer sides of the folding bars 39 and 40. This is, of course, obtained by an appropriate adjustment of the machine as hereinafter described prior to the beginning of a run and by appropriate stacking of the blanks.

The folding bars 39 and 40 may be vertically adjusted to accommodate for different thicknesses of blanks. They are secured at the front flanges 40a of brackets 332 (Figures 1, 3 and 13) by slots 40b in the vertical flanges 40c of bars 39 and 40 which are engaged by clamping nuts 40d. These nuts may be loosened to permit the bars 39 and 40 to be raised or lowered and may then be tightened again.

While the blank is in the stop position against stop 58, the folding plates 60 (Figure 1) which are each held on their respective cross arms 61 are driven around to fold the blank. Each of the cross arms 61 which supports its folding plate 60 is driven by link 62 which connects it to the crank 63, which in turn is driven from the folding blank operating box 64. The drive for folding plate 60 is thus substantially the same as described in my prior Patent No. 2,336,507.

The folding plate 60 is driven around by the mechanism thus described to fold the side panels of the blank around the folding bars 39 and 40 and to fold them down flat upon the remainder of the blank. The folding operation is facilitated first by reason of the fact that the folding plates 60 and 61 are downwardly bent at 67 in order that the side panels of the blank may readily ride up thereon.

Also, the folding operation is further facilitated by means of the deflecting plate 70 on each side (seen specifically in Figures 9 to 11) each of which terminates in an angularly positioned roller 71 so that the side panels are folded up of the order of 25° between plate 70 and roller 71 on each side even before the blank reaches the folding position.

The side panels are thus given an initial angularity with respect to the moving blank so that the folding plates need not rotate the side panels through a full 130° but must as shown by an examination of Figure 11 rotate through approximately only 150°.

The stop bars 73 are as shown in Figure 10 supported by the bracket arm 75 which in turn is pivotally supported on the fixed shaft 76 on each side.

The stop bar 73 on each side has a downward extension 78, the lower end of which is connected by eye bolt 79 to the tension spring 80, which in turn is connected to the lug 81 secured to the U-shaped members 22a which are fixed to the width of the folding boxes and adjusted with them.

Accordingly, the stop bar 73 on each side is maintained in raised position. The U members 22a serve to support the blank while in the fold-

ing section and then also serve to strip the folded blank from the stop when it retracts.

The two downward extensions 78 on each side of the machine each carries a roller 84 which is engaged by the lever bar 85a on the levers 85 on shaft 86. After the folding operation has been completed, the shaft 86 is rotated counterclockwise to rotate the lever 85 counterclockwise and push down the rollers 84 of extensions 78. This pushes down the stop bars 73 which move down with the bracket 75 which in turn rotates about the shaft 73. This in turn pulls down the stops 58 on each side and thus removes the stop members from the leading edge of the blank.

The machine is so arranged and timed that as soon as the stops 58 are depressed by the action of lever 85, slat 90 mounted across the chains 91 moves up into engagement with the rear of the folded blank and moves the blank beneath the hold-down strip 92 which strip is adjustably supported.

Hold-down slat 92 is provided with a rack 92a engaged by pinion 93 on shaft 94 provided with handle 94a. Rotation of handle 94a will adjust the hold-down slat 92 longitudinally by feed screw 93 operated by knurled knob 94 on the cross bar 85. The hold-down strip 92 is adjusted so that it extends just in front of the stops 58. The front end is curved upwardly so that panels which tend to spring up after being folded will be guided down again and their edges brought to abutting position. As soon as the slat 90 on chains 91 engages and moves it forward further through the machine, the guide presses down on the same between the panels and prevents the folded blank from opening up.

The blank is then carried forward between the limiting rolls 100, 101 which as shown in Figure 3 loosely control the position of the delivery end of folding bars 39 and 40. Since the folding bars 39 and 40 are supported from the front guide elements of the stacking device and since the free or delivery ends of the folding bar are substantially distant from their supports, they may be moved through a small angle.

The rollers 100, 101 above and below, respectively, each of the folding bars 39 and 40 limit the upward and downward movement of the free ends of the folding bars 39 and 40 so that they will not be flexed to too great an extent. These rollers also serve, in addition to controlling the position of the free ends of the folding bars 39 and 40, to control the blank and hold it in a somewhat central position so that the edges of the blank will be properly engaged by the straightening rolls 110.

The straightening rolls 110 are each mounted on stub shafts 111 which in turn are supported on the adjustable plates 112, 112. Straightening rolls 110 on each side are aligned with each other and are provided with grooves as shown in Figure 3 adapted to receive the folded edge of the blank. The plates 112, 112 are adjusted so that the peripheries of the aligned rollers 110 on each side are spaced apart by a distance which is slightly less than the width of the folded blank. The slat 90 forces the blank between the rolls 110 with the edges of the blank riding in the annular grooves on each side. Since the rolls are thus spaced slightly closer together than the width of the blank, the crease or fold is adjusted and spread vertically.

The movement of the slat which maintains the body of the blank normal to its direction of travel holds the blank at the correct angles with re-

spect to the rolls 110 so that in a properly folded blank the crease is adjusted regularly on each side.

Where the score line was initially incorrect or where the panel was folded improperly, the score lines are adjusted and straightened so that recreasing rolls 120 may then recreate or press the fold properly. The rolls 110 adjust and spread the crease to a greater width at that portion of the blank which has been widened by the skewed folding.

As the blank leaves the crease adjusting rolls 110, it passes between the pressure rolls 120, 120 which recreases the blanks as the blanks are delivered. Since the blank is maintained with its side edges exactly parallel to its path of movement by the slat 90, the recreasing operation performed by recreasing rolls 120 forms the crease in exactly the right position.

I have found that panels which have been skewed so that the trailing or leading edge of the panel projects over the edge of the main body of the box by more than a quarter of an inch have been straightened and properly recreated by this operation. Blanks which had been improperly scored, so that when folded up the panel would be skewed, have been corrected and straightened during the passage through the folding machine.

My machine, therefore, reduces the waste of blanks and makes it possible to utilize blanks even though they have been improperly or carelessly creased or scored.

This type of recreasing operation has also been described in my prior Patent No. 2,336,507 wherein several spaced crease adjusting rolls are shown on each side. While spaced crease adjusting rolls have been able properly to recreate and correct skewed blanks, I have found that by placing the crease adjusting rolls 110 in closely spaced relation as shown in Figures 1 and 3, a greater degree of skew may be corrected.

Each of the said slats 90 mounted across the chains 91 has a recess 130 so that it may readily slide or move on either side of the hold-down slat 92.

The folded blanks are preferably delivered to a taping machine and the bar 126a serves to hold down the panels of the folded blank right up to the point of tape application. Side guides 140a are provided to guide the blanks into the straightening section without marring the front corners of the box.

The apparatus comprises, as previously pointed out, a number of improved elements, each of which cooperate with each other and with the entire machine in order to provide for increased speed and facility of operation.

Referring to Figure 5, a variable speed D. C. motor 150 with the sprocket 151 drives the sprocket 152 which is mounted on shaft 153 which carries sprocket 154 of Figure 1. Sprocket 154 provides power to pull the chains 91. Chains 91 are in turn held by idler sprockets 155 on shaft 156 (Figures 1 and 3). Idler sprocket 157 (Figure 3) is adjustably mounted to tighten the chains. Shaft 153 also holds sprocket 160 which in turn drives sprockets 161, 162 and 163 thus driving the lower delivery shaft 141 and the upper delivery shaft 140 and the taper cam shaft 166.

Referring to Figure 1, the end of shaft 153 holds a bevel gear 170 which drives bevel gear 171 on shaft 172. Bevel gear 173 on shaft 172 (also in Figure 12) drives bevel gear 174 on stud 175 and

so drives drop-off cam 176 which is mounted on bevel gear 174. Roller 177 on arm 178 engages the periphery of cam 176; thus an oscillatory motion is imparted to lever 178 and to shaft 86 on which it is mounted; the shaft 86 as mentioned before serves to retract the stop 58. Set screw 180 held in housing 181 engages an arm of lever 178 and serves to limit the angular motion of the lever 178 and also of the shaft 86.

Referring back to Figure 1, the shaft 172 is connected to shaft 200 by means of the coupling 201. Bevel gear 202 on shaft 200 drives bevel gear 203 on shaft 204 which provides power to both of the folding boxes 64. Bevel gear 205 on shaft 209 drives bevel gear 205 on shaft 207 and thus turns the spur gear 208 which also is keyed to shaft 207.

Referring to Figure 2, gear 208 meshes with gears 209, 210, and 211 and thus drives gears 220, 221 and 222. Gear 222 drives gear 223. It can be seen that by means of this gearing the feed rolls 35, 36, 37, 38 and 41 are all driven. Also that gears 35 and 38 are pivotally held on the centers of gears 222 and 209, respectively, so that these feed rolls when spring biased will adjust themselves to any thickness of blank.

Referring back to Figure 1, gear 230 on shaft 200 drives gear 231 which holds bevel gear 232. Bevel gear 232 drives bevel gear 233 on the kicker drive shaft 234.

Referring to Figure 4, the crank 235 which is keyed to shaft 234 drives link 236 which in turn drives crank 237 and link 238. Link 238 is a pin-connected link which transfers the variable rotary motion of pin 239 on link 237 to a variable reciprocating motion of pin 240 on kicker carriage 241. Carriage 241 carries the kicker bar 242 in such a manner that the bar is adjustable relatively to the carriage by means of the T-shaped member 243 and the screw 244. The spring kickers 27 are mounted on the kicker bar 242 in order to obtain adjustment for uneven blanks.

The bar 31 cooperating with the elevated kicker makes it possible to take warped sheets without interfering with kicking or ejecting operation. Bar 31 is undercut at 31a to permit the spring kickers 27 to enter beneath and thus make possible the feeding out of short sheets.

All members which engage the edges of the blank are provided with nuts which in turn are driven by screws, all of which are driven from a common source on each side of the machine in order to adjust the machine for different widths of blanks.

The motor 300 in Figure 2 drives the shaft 301 through a worm gear reduction 302. Shaft 301 holds a sprocket 303 (Figure 1) which engages a chain 304 which passes over sprockets 305, 306, and 307. Sprockets 305, 306 and 307 drive screws 308, 309 of Figure 10 and 310 of Figure 1, respectively, and these in turn serve to adjust the straightening roll bracket 112, the stop and deflector assembly of Figure 10, and the folding box 64 of Figure 1, respectively.

At the other end of shaft 301 is a sprocket 320 which by means of chain 321 drives sprockets 322 and 323. Sprocket 324 is an idler for the purpose of tightening chain 321.

Referring to Figure 6, sprocket 322 is keyed to screw 343 which engages nut 343a of Figure 1 mounted on frame 325. Frame 325 holds the side gauge 326 shown also in Figures 2 and 6. Sprocket 323 is keyed to screw 330 which engages nut 331 on frame 332 shown in Figures 1 and 3.

Frame 332 serves to hold front gauge 25 and also the folding guide bar 39.

Since the sprocket 322 contains half as many teeth as the sprocket 323 and since their respective screws 343 and 330 have the same lead, the frame 325 which holds the side gauge 326 will be moved twice as far as the frame 332 for a given movement of the chain 321 and of the sprocket 320. The frames 325 and 332 are supported on bars 351 and 352 in Figure 3. These bars are held at both ends by the brackets 353 and 354 (Figure 6) which are mounted on housings 355 and 356, respectively.

Referring to Figure 10 in a similar manner, the carriage 312 is mounted on the two bars 76 and 360 which are in turn supported in the side frames of the machine.

Referring now to Figures 1, 2 and 3, I have here shown my novel form of slitting and scoring machine which comprises the side frame members 420 and 421 which are interconnected in any suitable manner as, for instance, by the base plate 422 and cross-bar 423.

The slitting and scoring shafts 424, 425; 424a, 425a, 424b, 424b are mounted on the rotatable spider 426 so that any pair of shafts with the slitting and scoring blades previously set up may be rotated into appropriate position.

The slitting and scoring blades 430, 431 are arranged on their respective shafts to form the appropriate slits or scores in the box blank just prior to folding.

Motive power for the shafts and for the spider may be obtained from any suitable source, not shown, in a manner well-known in the construction and operation of slitting and scoring machines.

In the foregoing I have described my invention solely in connection with specific illustrative embodiments thereof. Since many variations and modifications of my invention will now be obvious to those skilled in the art, I prefer to be bound not by the specific disclosures herein contained but only by the appended claims.

I claim:

1. Apparatus for making a tubular collapsed box from a blank, said apparatus comprising means for supporting a stack of blanks; means for feeding blanks successively from the stack; creasing and slitting rollers extending transversely of the path of movement of said blanks; said feeding means directing each successive blank into said creasing and slitting rollers; feed rollers located on the other side of said creasing and slitting rollers from said feed means; an overrunning drive for said feed rollers, said blank being moved by said feed rollers, the peripheral speed of said feed rollers when driven being equal to the peripheral speed of said creasing and slitting rollers; a high speed feed roll located beyond said first mentioned feed rolls; oscillatable blank panel folding plates; said high speed feed roll, when the blank reaches the same drawing the blank from the first mentioned feed rolls at a higher speed than the driven speed for said feed rolls and moving said blank into position to be engaged by said folding plates; means for rotating said folding plates on an axis parallel to the path of movement of said blank; stop means holding said blank stationary during the folding operation of said folding plates; and blank delivery means engaging said blank and moving the same from the folding position after the folding operation is completed.

2. Apparatus for making a tubular collapsed box from a blank, said apparatus comprising means for supporting a stack of blanks; means for feeding blanks successively from the stack; creasing and slitting rollers extending transversely of the path of movement of said blanks; said feeding means directing each successive blank into said creasing and slitting rollers; feed rollers located on the other side of said creasing and slitting rollers from said feed means; an overrunning drive for said feed rollers, said blank being moved by said feed rollers, the peripheral speed of said feed rollers when driven being equal to the peripheral speed of said creasing and slitting rollers; a high speed feed roll located beyond said first mentioned feed rolls; oscillatable blank panel folding plates; said high speed feed roll, when the blank reaches the same drawing the blank from the first mentioned feed rolls at a higher speed than the driven speed for said feed rolls and moving said blank into position to be engaged by said folding plates; means for rotating said folding plates on an axis parallel to the path of movement of said blank; stop means holding said blank stationary during the folding operation of said folding plates; and blank delivery means engaging said blank and moving the same from the folding position after the folding operation is completed, all of said feed means, rolls, folding plates and delivery means being driven from a single power source.

3. Apparatus for making a tubular collapsed box from a blank, said apparatus comprising means for supporting a stack of blanks; means for feeding blanks successively from the stack; creasing and slitting rollers extending transversely of the path of movement of said blanks; said feeding means directing each successive blank into said creasing and slitting rollers; feed rollers located on the other side of said creasing and slitting rollers from said feed means; an overrunning drive for said feed rollers, said blank being moved by said feed rollers, the peripheral speed of said feed rollers when driven being equal to the peripheral speed of said creasing and slitting rollers; a high speed feed roll located beyond said first mentioned feed rolls; and oscillatable blank panel folding plates; said high speed feed roll, when the blank reaches the same drawing the blank from the first mentioned feed rolls at a higher speed than the driven speed for said feed rolls and moving said blank into position to be engaged by said folding plates, said first mentioned feed rolls being located closer together and closer to the slitting and creasing rolls and the high speed feed roll than the shortest blank to be operated on by the machine, said high speed feed roll being located at a greater distance from said slitting and creasing rolls than the length of the greatest blank to be operated on by the machine.

4. Apparatus for making a tubular collapsed box from a blank, said apparatus comprising means for supporting a stack of blanks; means

for feeding blanks successively from the stack; creasing and slitting rollers extending transversely of the path of movement of said blanks; said feeding means directing each successive blank into said creasing and slitting rollers; feed rollers located on the other side of said creasing and slitting rollers from said feed means; an overrunning drive for said feed rollers, said blank being moved by said feed rollers, the peripheral speed of said feed rollers when driven being equal to the peripheral speed of said creasing and slitting rollers; a high speed feed roll located beyond said first mentioned feed rolls; folding mechanism; said high speed feed roll, when the blank reaches the same, drawing the blank from the first mentioned feed rolls at a higher speed than the driven speed for said feed rolls and moving said blank into position to become engaged by said folding mechanism; stop means holding said blank stationary during the operation of said folding mechanism, and blank delivery means engaging said blank and moving the same from the folding position after the folding operation is completed.

5. Apparatus for making a tubular collapsed box from a blank, said apparatus comprising means for supporting a stack of blanks; means for feeding blanks successively from the stack; creasing and slitting rollers extending transversely of the path of movement of said blanks; said feeding means directing each successive blank into said creasing and slitting rollers; feed rollers located on the other side of said creasing and slitting rollers from said feed means; an overrunning drive for said feed rollers, said blank being moved by said feed rollers, the peripheral speed of said feed rollers when driven being equal to the peripheral speed of said creasing and slitting rollers; a high speed feed roll located beyond said first mentioned feed rolls; folding mechanism; said high speed feed roll, when the blank reaches the same, drawing the blank from the first mentioned feed rolls at a higher speed than the driven speed for said feed rolls and moving said blank into position to become engaged by said folding mechanism; stop means holding said blank stationary during the operation of said folding mechanism, and blank delivery means engaging said blank and moving the same from the folding position after the folding operation is completed, all of said feed means, rolls, folding mechanism and delivery means being driven from a single power source.

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