

Aug. 13, 1968

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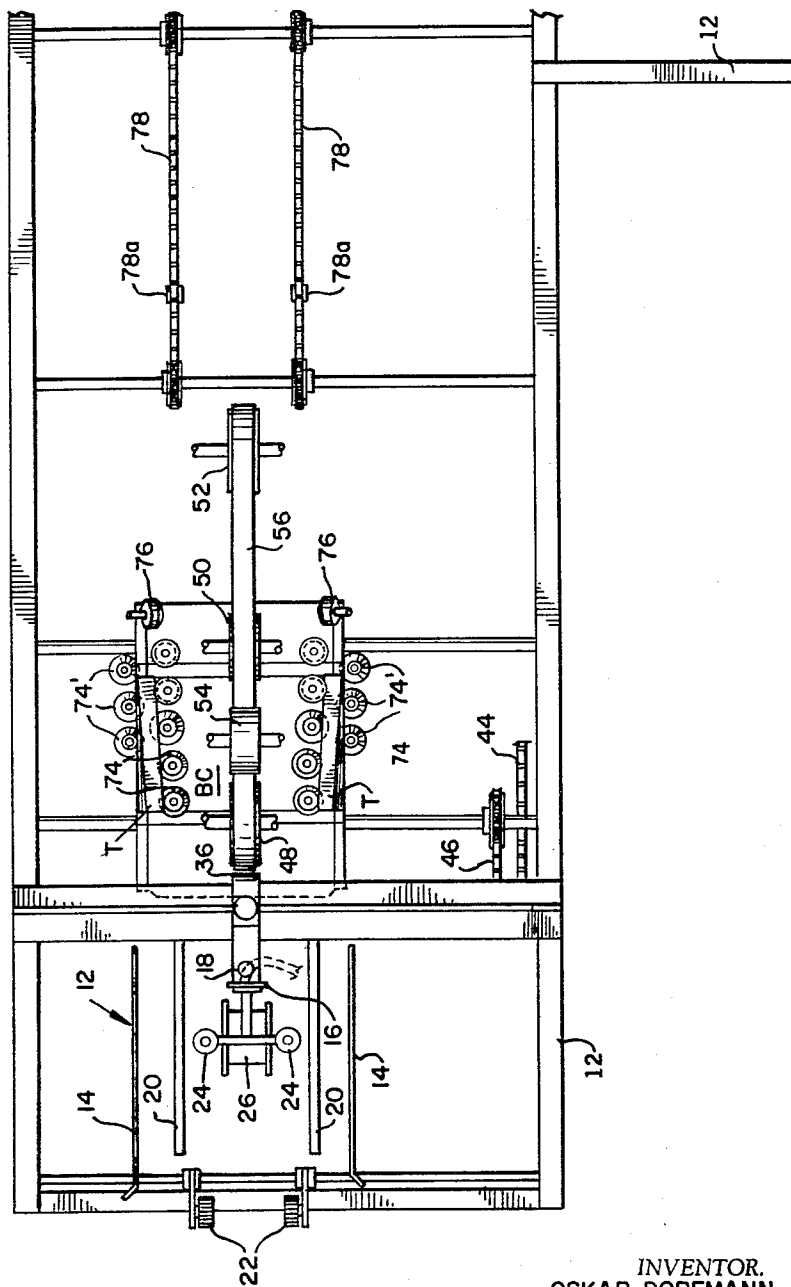
3,396,508

CARTON ERECTING AND FILLING MACHINE

Filed Oct. 22, 1965

4 Sheets-Sheet 2

FIG. 2a



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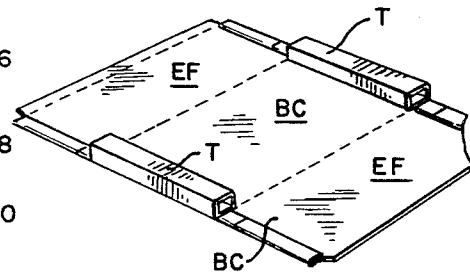
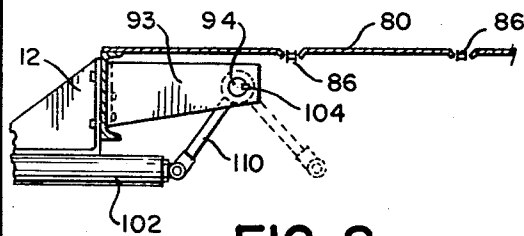
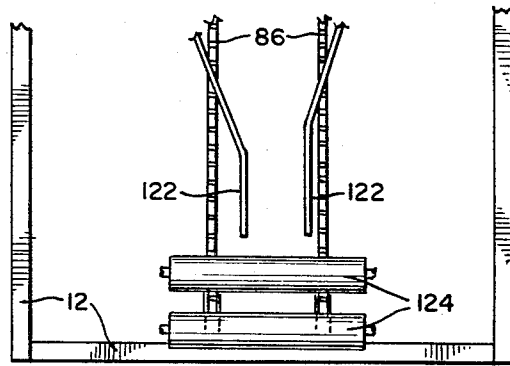
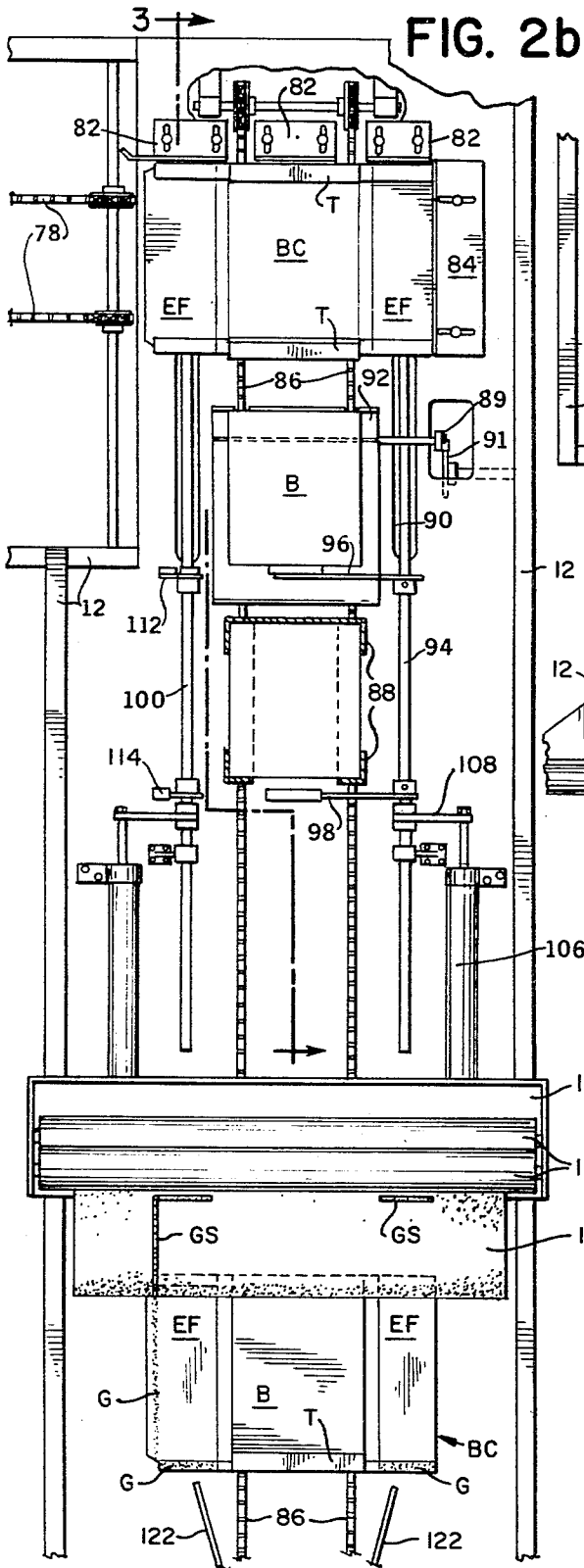


FIG. 9

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FIG. 3

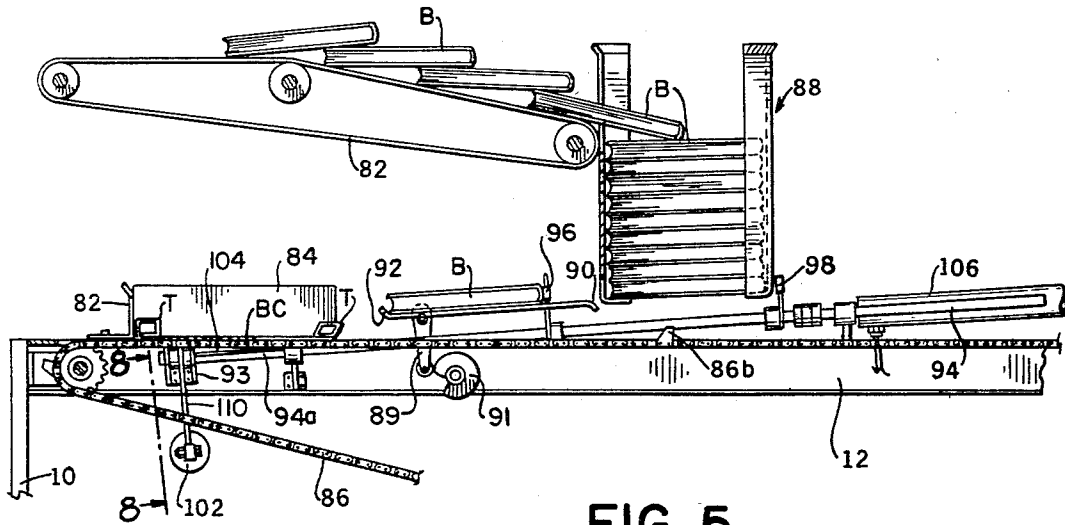


FIG. 4

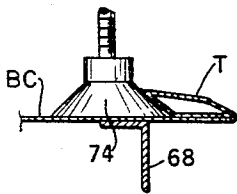


FIG. 5

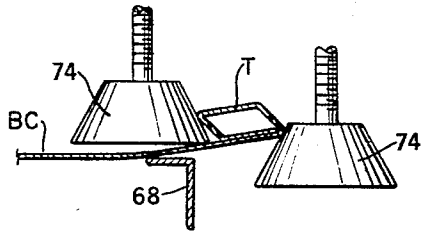


FIG. 6

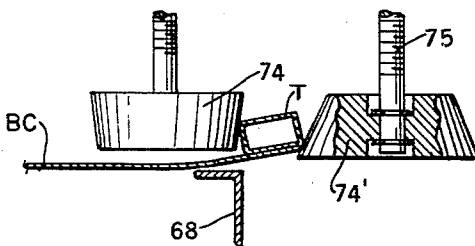
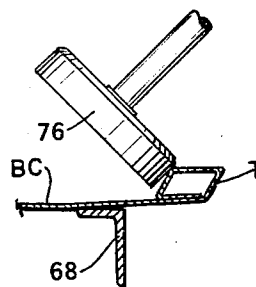


FIG. 7



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CARTON ERECTING AND FILLING MACHINE
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Filed Oct. 22, 1965, Ser. No. 500,670

6 Claims. (Cl. 53—186)

ABSTRACT OF THE DISCLOSURE

The following disclosure sets forth a machine for erecting box or carton blanks of the type having tubular end walls, filling the erected carton, and thereafter sealing the carton with the contents therein. Means are provided for taking blanks sequentially from a hopper and depositing them on a belt which moves the blanks between cooperating sets of rollers located at each side of the blank in the direction of travel, the rollers being of frusto-conical form and having sides inclined to the horizontal in the direction of feed of the blank, the rollers engaging the inner and outer sides of the tubular end walls of the carton to move these end walls from the flattened condition to an erect position, and in fact to a position beyond the vertical in order to assure that when the tubular end walls are free of the rollers, they will return to the vertical, owing to their inherent tendency to return toward the original flattened position. Means are also provided for taking articles to be loaded into the box blanks, in the particular instance, books, from a hopper and depositing them in the cartons, after which side flaps of the blank are folded upwardly and cover flaps folded over the book and glued together.

The combination of this invention is devised for cooperation with a specialized type of carton blank, examples of which are the subject matters of copending applications, Ser. Nos. 378,645, filed June 29, 1964, now Patent No. 3,250,455; 457,124, filed May 19, 1965, now Patent No. 3,315,869, and 458,119, filed May 24, 1965, now Patent No. 3,331,548.

The subject matter of this invention will be best understood from the following detailed disclosure of an illustrated embodiment thereof, such as shown in the accompanying drawings.

In those drawings:

FIGURE 1 is a side elevational view, partly in diagrammatic form, of the portion of the machine of this invention consisting of the carton feeding mechanism, the end wall erecting mechanism and the article depositing mechanism;

FIGURE 2a is a top plan view of the portion of the mechanism of FIG. 1 comprising the carton feeding mechanism and the end wall erecting mechanism;

FIGURE 2b is a top plan view of the remainder of the machine showing the article depositing mechanism and the gluing and folding mechanism, it being noted that the structure of this figure extends at right angles to the right hand end of the structure of FIG. 2a;

FIGURE 2c is a top plan view of the lower terminal end of the mechanism of FIG. 2b;

FIGURE 3 is a cross sectional view taken approximately on the line 3—3 of FIG. 2b;

FIGURES 4, 5, 6 and 7 are detailed cross sectional views taken on the correspondingly cross sectionalized lines of FIG. 1;

FIGURE 8 is a detailed cross sectional view taken on the line 8—8 of FIGURE 3; and

FIGURE 9 is a diagrammatic perspective view of the type of carton to be processed by the machine of this invention and illustrated in greater detail in the above mentioned copending applications.

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The carton illustrated in FIG. 9 is specifically designed and dimensioned to serve the function of packaging and transporting books. It will, of course, be apparent from this disclosure that the article to be packaged is not limited to books. In addition, the details of construction of the carton can be varied without interfering with its processing in the machine herein disclosed. The primary requisite of the carton is that it have a pair of tubular end walls at an opposite pair of edges which are folded or crushed down flat prior to use. Thus, as shown in FIG. 9, the carton BC has a bottom wall, at the end edges of which are integral tubular end walls T formed by folding the material along a series of parallel lines and fastening the terminal edges down so as to form tubes of rectangular cross section, as illustrated. The remaining pair of edges of the bottom wall extend into a pair of end flaps EF, providing the material for the side walls and cover flaps for the container when folded over into contacting relation. The tubular end walls are pressed inwardly flat against the bottom wall at the time of manufacture to facilitate their packaging and transportation to the point of use. At the point of use the flattened tubular end walls T must be bent up into erected rectangular form, as illustrated in FIG. 9, see also FIG. 3.

Referring to FIG. 1, the machine includes a suitable structural framework 12 mounted on legs or standards 10, all made of any material adapted to this purpose. The left-hand end of the framework is a carton feeding mechanism indicated generally at 12. This mechanism includes a pair of side walls 14 and a gate mechanism 16 forming an open ended enclosure in which a plurality of cartons BC can be stacked in a pile. The vertical depth of the gate can be adjusted by the control 18 and the feeding mechanism includes a hold-down roller support 36, which will be referred to later. Also associated with the carton feeding mechanism are the back supporting rollers 22 which lie under the rear end of the carton stack. In the plane of the lower edges of the side walls 14 are a pair of rails 20, on which the carton stack rests.

In the carton feeding mechanism herein diagrammatically illustrated the carton blanks are separated from the bottom of the stack by means of suction cups 24 connected by the flexible tube 32 to the suction pump 34. The cups are mounted on an operating mechanism 26 which is actuated through a cam follower 28 cooperating with the cam 30. It is to be noted that the carton feeding mechanism is not shown in complete detail because it is intended that any mechanism of this type, adapted to the purpose, can be used. The feeding mechanism illustrated is an example of one well known commercial type, but there are a number of others suited to the purpose. This part of the mechanism is not intended to be novel, the object being merely to illustrate the successive feeding, one at a time, of carton blanks from a stack into a defined path of travel.

As illustrated, the carton blanks BC are fed by the suction cups one at a time through the mouth of the gate 16 on to a power driven feeding belt 38. As illustrated, this belt passes around a driving roller 40 journaled for rotation on bearings mounted on the frame 12. At the point of exit of the blanks from the feeding mechanism they are gripped between pressure idler rollers 42 positioned above and below the feeding belt 38 as illustrated so as to cause the blanks to be fed endwise to the right in FIG. 1.

Mounted on opposite sides of the plane of travel of the blanks are the upper and lower feed belts 56 and 66 for carrying the blanks through the mechanism for erecting the flattened tubular end walls T of the blank. The upper belt 56 passes around a series of idler rollers 48, 50, 52 and 54. Likewise the lower belt 66 passes around a series of rollers 58, 60, 62 and 64. All of these rollers are

journaled on shafts, which are supported in uprights on the machine frame 12, as shown. It is noted that in the case of the roller 58 it is connected to its shaft and hence is driven through sprockets and a chain 46 from the power driven shaft of the feed roller 40. This shaft is driven by a sprocket chain 44 from any suitable power source not shown, such as an electric motor. At this point it may be noted that the suction cup mechanism is also driven from the same shaft through the feed belt 38.

It will be noted that the lower flight of belt 56 and the upper flight of belt 66 are arranged to travel in parallel planes, the former above the plane of movement of the carton blank and the latter below that plane. The upper flight of the belt 66 is supported to travel in a horizontal plane by a series of idler rollers 70 journaled to be rotated on their axes by the belt. The two parallel flights of belt are arranged and held so as to frictionally grip the carton blank between them along its longitudinal axis, see FIG. 2a. It is preferable but not essential to use an upper set of spring loaded pressure rollers 71, see FIG. 1, engaging the top face of the lower flight of belt 56. Thus, the carton blanks BC are successfully fed one at a time endwise from the feeding position to and through the end wall erection position.

The erection of the flattened tubular walls T of the carton is accomplished by a series of idler rollers 74, which are arranged in cooperating sets on opposite sides of the carton blank and mounted on the supports 72, see FIG. 1. The erecting rollers 74 are journaled, as indicated in FIG. 6 for one of the rollers, on threaded shafts 75, the rollers being secured thereon for free rotation and are driven by frictional engagement with the tubular walls T of the carton blank. As will be seen from inspecting FIGS. 4-6 inclusive, these rollers, all of which have frusto-conical operating surfaces, are of gradually increasing inclination from the entrance end of the erection portion of the machine, that is the left hand end in FIGS. 1 and 2. Thus, as shown in FIG. 4, the flattened tube T is first engaged with the least sharply inclined deflecting roller 74. Thus, the entering end of the tube is first lifted, as indicated in FIG. 4. As the blank proceeds to advance it is lifted and engages the next more sharply inclined deflecting roller 74 and is then engaged, as shown in FIG. 6, with the next roller 74. By comparing FIGS. 4, 5 and 6 it will be seen that the tube T is raised gradually from a flattened position to a rectangular form. In order to provide an abutment against which the erecting forces can react a series of cooperating rollers 74' are spaced along the path of travel, as shown in the figures, to engage the diagonally opposite corner of the gradually rising rectangle. The relationship of these rollers is clearly shown in FIG. 1 and there is a set thereof on each side of the path of travel of the carton blank BC. It can also be seen in FIG. 2a that the flattened tubes T are gradually raised from compressed position to erected rectangular position as the blank cooperates with the roller sets 74 and 74'. It is noted, as mentioned above, that these rollers 74 and 74' are free running and are driven by reason of the engagement of the blank therewith.

Since the crushed or flattened carton material inherently tends to spring part of the way back to its original flattened condition it is necessary that in erecting the tubes they be oversprung in an erecting direction so that when they are released they will return to an approximately correct rectangular cross section. This is accomplished by means of the last set of rollers 76, see FIG. 7, which deflect the tubes beyond erected position. As the blank moves past the rollers 76 the tubes T will spring back to approximately rectangular shape. It is preferable that the tubes be oversprung sufficiently so that when released they will not return to an exact rectangular position, but only approximately so, preferably being slightly inclined outwardly as indicated in FIG. 3.

The belts 56 and 66 continue to feed the blanks endwise out of the erecting mechanism and into the sphere

of operation of the feeding belts 78. These belts can be chain belts and driven by means of sprocket wheels as indicated. Mounted on the chain belts at properly spaced positions are the abutments 78a and 78b. The chain belts 78 are timed so that as a carton blank is fed from the belts 56 and 66 it will be deposited on the chains 78 and be engaged by a pair of abutments, for example, the abutments 78a. Thus, the blank continues to move endwise until it is deposited upon a table 80, see FIG. 2b. In order to position the blank BC on this table, adjustable side and end abutments 82 and 84 are provided. The table 80 is sectionalized so that the upper flight of another pair of feeding chains 86 can engage the blank through properly spaced abutments 86a secured to these chains, see FIG. 1. It will be seen by reference to FIG. 2b that the carton blank is fed from left to right on to the sectionalized table 80 and, when picked up by the abutments on the chain 86, will now move at right angles to its previous path of travel, that is from the top towards the bottom of FIG. 2b.

It is indicated in FIG. 3 that the articles to be deposited in the cartons are the books B, which are fed into a hopper 88 of any suitable form by means of a feeding belt 82. The books are thus formed into a stack and are delivered from the bottom of the stack in a direction opposite to the movement of the feed chains 86, see FIG. 3. They are delivered one at a time on a platform having the fixed part 90, on which is pivoted the part 92. From there, as will be explained, they are in turn deposited into the waiting carton blank BC. This waiting period is indicated by the fact that the blank has been delivered on to the platform 80 in advance of the arrival of the abutment 86a on the chain 86.

In order to deliver the books from the hopper 88 one at a time a feeding mechanism is provided, which includes a pair of longitudinally extending rods 94 and 100 journaled in suitable bearings for oscillatory movement. Secured to the rod 94 is an arm 96 and rearwardly thereof is an arm 98. These arms are positioned so as to engage, as illustrated in FIG. 3, the right-hand ends, in this case the binding, of the book B. Similarly mounted on the rod 100 are a pair of arms 112 and 114. When the arms 96 and 98 are down in position to engage the edge of a book the arms 112 and 114 extend vertically, see FIG. 1.

Mechanism is provided for effecting oscillation and longitudinal or axial movement of the rods 94 and 100. Thus, as shown in FIG. 8, there is mounted on the machine frame 12 a cylinder and piston air engine 102, the piston rod of which is connected by means of an arm 110 to the rod 94 which is in a bracket 93 mounted on the frame. The arm 110 has a key 104 engaging in a spline 94a cut in the rod 94. Also mounted on the frame is another cylinder and piston air engine 106, the piston rod of which is connected by means of an arm 108 to the rod 94. The purpose of this mechanism is to deliver a book from the bottom of the stack in the hopper 88 on to the platform 90-92 and from there into the carton. This is accomplished by the proper timed rotation first of the rod 94 to bring the arms 96 and 98 from a vertical position down into a position to engage the binding of the book. The rod 94 is then moved longitudinally, in this case in a direction opposite to the travel of the chains 86 so as to move a book from the platform 90-92 into the carton and a book from the bottom of the stack on to the platform 90. The transfer of the book from platform 90-92 is aided by tipping the pivoted part 92 counter clockwise to lower its edge. This is accomplished in proper timing by the cam 91 acting on lever 89, see FIG. 3. The air engine 102 causes this oscillatory movement of the rod 94 and the air engine 106 causes its longitudinal movement. Oscillation and reciprocation is permitted by the keyed spline and sliding connections between the rod and the levers 108 and 110 respectively. The abutment 86a on the chain 86 is timed to the feeding of the book from the platform 90-92, so that the book is deposited

into the carton between the tubular walls T, before the chain 86 moves the carton. The rod 100 with its arms 112 and 114 is similarly operated in timed relation so that these arms are activated alternately with the arms on the rod 94. For this reason the operating mechanism for oscillating and reciprocating the rod 100 will not be described in detail, it being a duplicate of that illustrated for the rod 94.

The carton with the book in it is now carried by the chains 86 under the hopper 88 and through the gluing mechanism. This mechanism is more or less standard gluing equipment and includes a glue well 116, glue feeding rollers 118 and a glue applying roller 120, which in this case has raised gluing surfaces GS, which are specially shaped to apply glue in the area indicated by the reference G in FIG. 2b. Thus, glue is applied to the ends of the carton and flaps EF and along one edge of one of the flaps, as indicated by stippling in this figure.

The assembly now moves into a standard form of cover closing mechanism 122 comprising guides properly inclined so as to raise the end flaps EF and fold them over into superposed relationship, all in accordance with well known practice. The closed carton passes between the pressure rollers 124 to cause the glued surfaces to adhere and seal the carton.

From the above description it will be apparent to those skilled in the art that the subject matter comprising the novelty herein is capable of variation in embodiment of detailed mechanisms and it is intended therefore that the disclosure herein be taken in an illustrative sense, for the scope of protection hereby afforded is to be determined by the appended claims.

What is claimed:

1. A combination as disclosed for erecting, filling and closing a carton of the type having a blank with a pair of flattened tubular walls positioned at an opposite pair of edges and a pair of end flaps, comprising, in combination, means for successively feeding box blanks along a

defined path, means for successively engaging the inner side walls of the flattened tubular end walls to erect said end walls of said blanks, means for depositing an article on each blank between the erected tubular walls and means for folding the end flaps of each blank to close the carton.

2. In the combination of claim 1 means for applying glue at selected portions of said carton for sealing it when folded.

3. In the combination of claim 1 said engaging and erecting means comprising sets of cooperating rollers engaging the flattened tubular walls to progressively erect them.

4. In the combination of claim 1 said engaging erecting means comprising cooperating pairs of frusto-conical rollers driven by engagement with said blank.

5. In the combination of claim 4, said cooperating pairs of frusto-conical rollers comprising rollers engaging the outer side walls of said flattened tubular walls, and rollers engaging the inner side walls thereof, said last-mentioned rollers having increasing angles of inclination to the horizontal in the direction of feeding movement.

6. In the combination of claim 4, a pair of rollers spaced from the last one of said frusto-conical rollers in the direction of feeding movement, said rollers being mounted on inclined axes and engaging the inner sides of the flattened tubular end walls to cause said walls to be bent beyond the vertical with respect to the box bottom.

References Cited

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TRAVIS S. McGEHEE, *Primary Examiner*.

E. F. DESMOND, *Assistant Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,396,508

August 13, 1968

Oskar Dorfmann

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 31, "forimng" should read -- forming --. Column 6, line 14, after "engaging" insert -- and --.

Signed and sealed this 10th day of March 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attending Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents