

Dec. 30, 1958

O. E. COTE

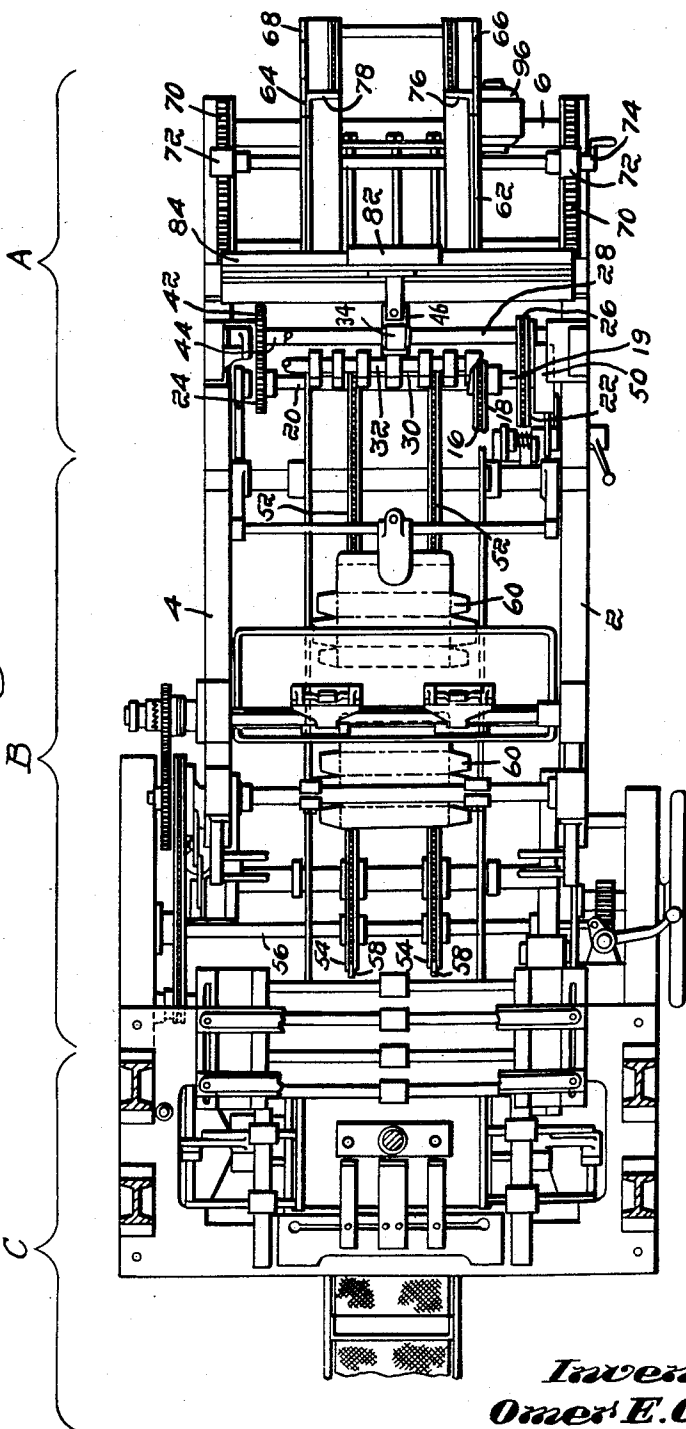
2,866,641

BLANK FEEDER FOR A BOX MAKING MACHINE

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5 Sheets-Sheet 1

Fig. 1.



Inventor:
Omer E. Cote,
by *Cyrilley Clutick*
Attorney

Dec. 30, 1958

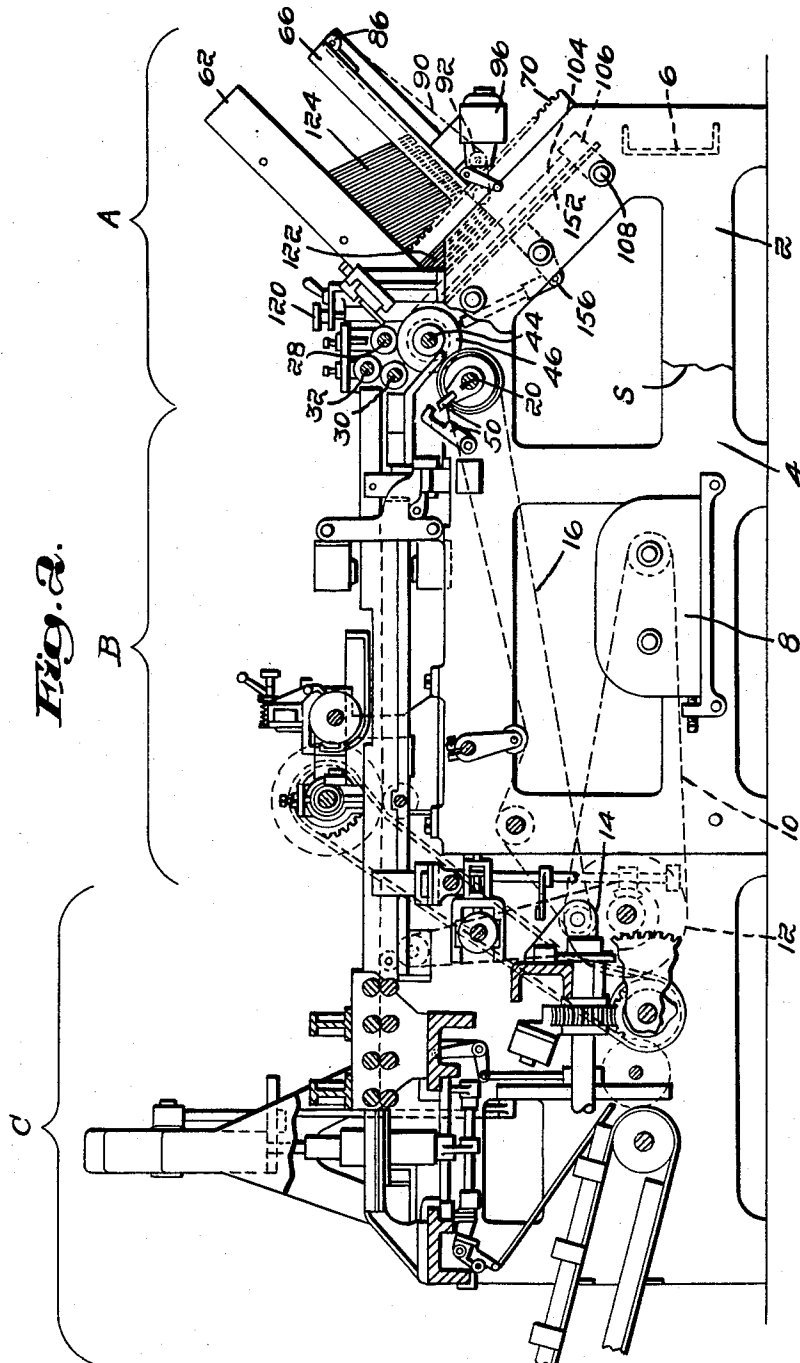
O. E. COTE

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BLANK FEEDER FOR A BOX MAKING MACHINE

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5 Sheets-Sheet 2



Inventor:
Omer E. Cole,
by **Cyrus C. Clutick**
Attorney

Dec. 30, 1958

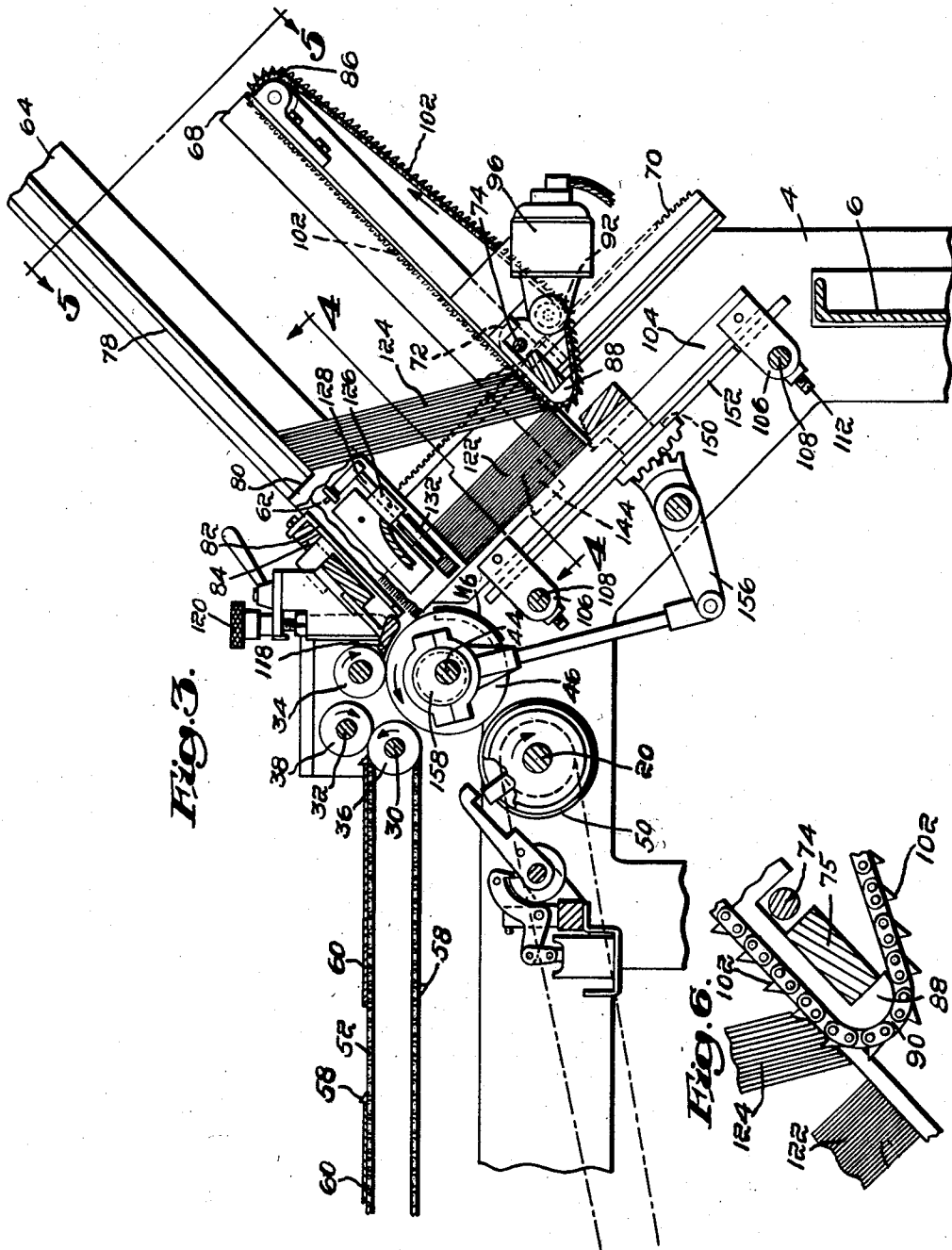
O. E. COTE

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BLANK FEEDER FOR A BOX MAKING MACHINE

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5 Sheets-Sheet 3



Inventor:
Omer E. Cote,
by **Cydney Chittick**
Attorney

Dec. 30, 1958

O. E. COTE

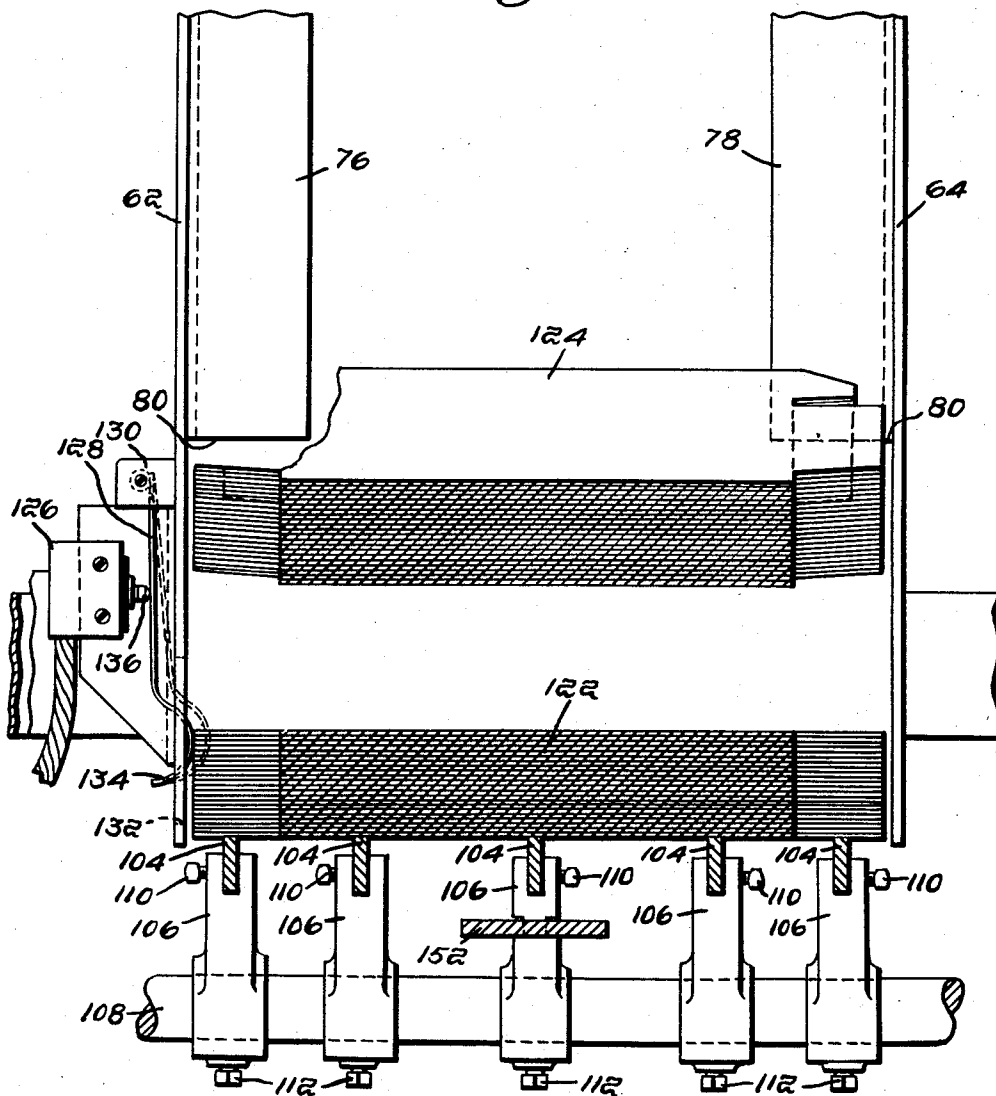
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BLANK FEEDER FOR A BOX MAKING MACHINE

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Fig. 4.



Inventor:
Omer E. Cote,
by **C. J. Clutick**
Attorney

Dec. 30, 1958

O. E. COTE

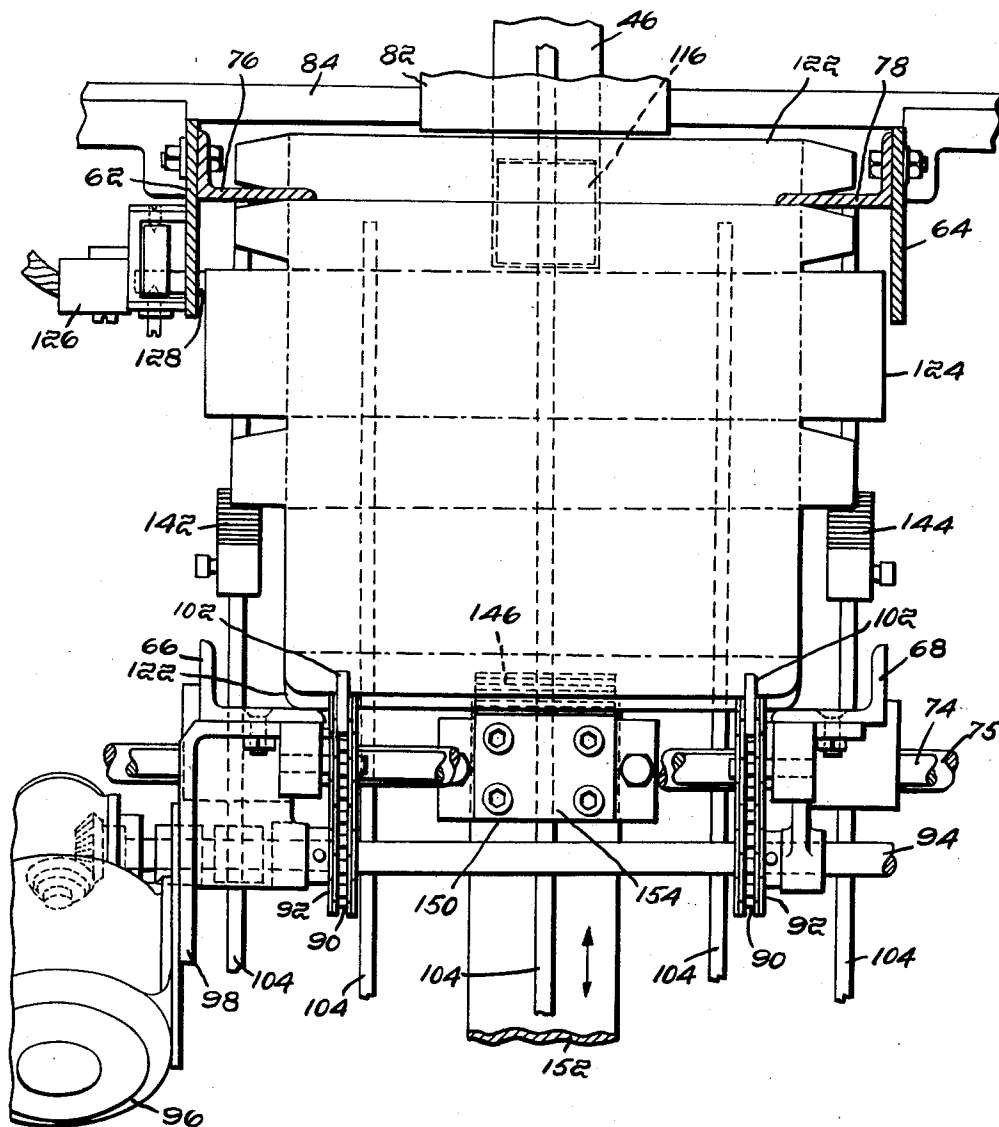
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BLANK FEEDER FOR A BOX MAKING MACHINE

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5 Sheets-Sheet 5

Fig. 5.



Inventor:
Omer E. Cote,
by **Clifford Cluteck**
Attorney

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BLANK FEEDER FOR A BOX MAKING MACHINE

Omer E. Cote, Providence, R. I., assignor to United States Automatic Box Machinery Company, Boston, Mass., a corporation of Massachusetts

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4 Claims. (Cl. 271—44)

This invention relates to box making machinery and is particularly concerned with a method and mechanism for causing individual box blanks to be fed one at a time into a box making machine.

In the manufacture of boxes of the type formed from a single box blank, the pre-cut blanks arranged in a pile are customarily placed in the machine in such relation to the feeding mechanism that the blank on the bottom of the pile will be picked up and slid out from under the pile by feeding mechanism to be delivered to the box forming machinery.

In the blank feeding mechanism of the prior art, considerable difficulty has been experienced in feeding a single blank off the bottom of the pile of blanks. The individual blanks, being made of relatively thin cardboard stock, do not lend themselves to being gripped positively by conventional feeding mechanisms. The difficulty is accentuated by the weight of the pile of blanks which press down on the bottom blank to such an extent that there is considerable friction present which makes it difficult to slide the bottom blank out from under the pile. Various expedients have been used to minimize this friction, such as mechanism which agitates the pile of blanks or the provision of an air blast which is intended to initially separate the piled blanks so that the bottom blank may be moved out with more ease.

However, the problem has not heretofore been satisfactorily solved and accordingly, it is an object of this invention to provide a method and apparatus for feeding box blanks, the apparatus being of such construction that only the bottom blank will be picked up by the feeding mechanism and delivered into the box forming machine.

By this invention this is accomplished by first placing the pile of blanks in the magazine of the machine in a position in which each blank will be moved to slightly staggered position with respect to the adjacent blank, i. e., the blanks in their first position will be fanned slightly, thus causing initial freeing of each blank with respect to its neighbor; and thereafter taking from the bottom of the pile a limited quantity of blanks which are then located at the actual feeding position. By limiting the number of blanks in the pile at the feeding position to a small number, the pressure on the bottom blank will be so small that the feeding mechanism will easily start the bottom blank on its way.

Another object of the invention is the provision of mechanism which will positively preclude the feeding of two blanks simultaneously. Thus should the bottom blank be stuck to the blank directly above it, so that the two tend to start into the machine together, means is provided for stopping the upper one of the two blanks so that the feeding mechanism will move only the bottom blank into the machine.

These and other objects of the invention will be more clearly understood as the description proceeds with the aid of the accompanying drawings, in which:

Fig. 1 is a plan view of a box machine in which the

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feeding mechanism of the present invention is indicated at that section marked A;

Fig. 2 is a front elevation of Fig. 1 with the feeding mechanism again indicated at A;

Fig. 3 is an enlarged side elevation of the feeding mechanism as seen in Fig. 2 with certain parts being broken away for clarity;

Fig. 4 is a sectional view on line 4—4 of Fig. 3;

Fig. 5 is a sectional view on line 5—5 of Fig. 3;

Fig. 6 is an enlarged front fragmentary view showing a limited number of the box blanks resting on fingers of the feed chains comprising a part of the present invention with the lower several blanks having just lost their supporting fingers and being about to fall to the lower pile.

Referring to Figs. 1 and 2, there is shown a box making machine comprising (1) a blank feeding stage A, (2) a glue applying stage B, and (3) a box forming stage C. This invention is concerned primarily with the blank feeding stage and the successive stages are shown in the drawings only for the purpose of facilitating comprehension of the present invention.

Therefore, while reference hereinafter will be made generally to sections B and C of the machine, it will be understood that the box feeding mechanism of the present invention may be used with any type of box making machine and the invention is not to be limited in any way by its having been shown in conjunction with a specific type of glue applying mechanism and box forming mechanism.

The mechanisms of all three stages are driven by a single prime mover, e. g. motor, the timing relationship between the operation of the mechanisms of all three stages being such that a series of box blanks are caused to be fed from the feeding mechanism on to a conveyor which carries the blanks successively to glue applying stage B and box forming stage C.

Referring to Figs. 1 and 2, the machine comprises a suitable frame including vertical frame members 2 and 4 joined by suitable generally horizontal frame members such as 6. In Fig. 2, vertical frame member 2 is broken away at S to better illustrate certain mechanisms of the machine.

The machine includes a motor 8 which is connected by belts 10 to a pulley 12 which through conventional power transmission elements (not shown) drives chain drive gear 14 carrying drive chain 16. Drive chain 16 and sprocket gear 18 cooperate to turn hollow drive shaft 19.

Drive shaft 19 carries gear elements 22. Drive shaft 19 drives through clutch 50, the shaft 20 having thereon gear 24. Gear 22 drives chain 26 which through suitable gear elements (not shown) drives shafts 28, 30, and 32, bearing feed rollers 34, 36 and 38 respectively. (See Fig. 3.) Gear 24 on the drive shaft 20 meshes with gear 42 on shaft 44. The latter shaft carries large feed roller 46. All of these shafts are mounted by suitable journals to the vertical side frame members of the machine.

A clutch mechanism is shown generally at 50, the clutch being provided to permit decoupling hollow shaft 19 from shaft 20 when desired, as for example when a blank fails to appear at the box forming stage on schedule, due to jamming, or some other mishap. The clutch may be actuated by a suitable switch means, the means for actuating the clutch forming no part of the invention and accordingly not being shown.

Rotation of the foregoing shafts is timed with the movement of box blank conveyor chains 52 driven by shaft 30 and carried by idler sprockets 54 mounted on a shaft 56 rotatably secured to vertical frame members 2 and 4.

The conveyor chain has fingers or lugs 58 which as shown in Fig. 3, causes advancement of blanks 60 to stations B and C. The blanks are placed thereon by feed rolls 34, 36, 38, and 46 as described hereinafter.

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An expanded view of the feeding mechanism of this invention is shown in Fig. 3, Figs. 4 and 5 also contributing to a better understanding of the present invention. The feeding mechanism comprises a hopper or magazine formed by four upwardly extending angle iron corner posts 62, 64, 66, and 68, secured to the frame of the machine, the two lower posts being movable toward and away from the two upper posts by means of a conventional rack 70 and pinion 72 operated by crank spindle 74. Bar 75 is connected to pinion 72 and posts 66, 68, and causes these posts to move with the pinions when crank spindle 74 is turned. By this arrangement the hopper or magazine is adapted to receive box blanks of various sizes, and the corner posts may be so spaced that a stack of blanks received by the hopper will rest against the posts on an angle as shown in Fig. 3. Sides 76 and 78 terminate at their lower ends at 80 as shown in Figs. 3 and 4.

A guide surface 82 secured to the frame by a transverse bar 84 is positioned intermediate the upper posts with its upper edge located below the ends of sides 76, 78 of the upper posts, as shown in Figs. 3 and 4. Secured to the lower posts of the magazine are idler sprockets 86 and curved bearing surfaces 88. Riding on the idler sprockets and the bearing surfaces are feed chains 90 driven by sprockets 92. The latter sprockets are mounted on shaft 94 driven by motor 96. The motor is mounted by bracket 98 to lower post 66. Feed chains 90 have lugs or fingers 102 which engage the lower edges of the box blanks of stack 124 in the magazine. The upper edges of these box blanks rest against sides 76 and 78 of the upper posts, as shown in Fig. 3. Motor 96 drives feed chains 90 in the direction shown by the arrow in Fig. 3. At the bottom of the magazine are a plurality of guide bars 104 secured by guide bar supports 106 which are mounted by fixed shafts 108 extending through frame members 2 and 4 of the machine. Guide bars 104 and guide bar supports 106 are adjustably positioned by set screws 110 and 112 respectively.

Large feed roll 46 is positioned at the forward end of the guide bars and is provided with a rubber segment 116 for engaging the box blanks. Overlying this feed roll is a stop 118 which is vertically adjustable by mechanism 120. This stop is normally spaced from the rubber segment on feed roll 46 a distance equal to the thickness of one box blank. Thus when the bottommost blank of lower stack 122 is picked up by the rubber segment, the box blank next above it is prevented by the stop means from moving forward with the bottommost blank.

In order to maintain the proper number of blanks at the feeding section, sensing mechanism is provided for controlling the operation of motor 96. This mechanism will now be described. As seen in Figs. 3, 4, and 5, a switch 126 is mounted on the outside of upper corner post 62. This switch is actuated by a lever 128 pivoted at 130 to swing toward and away from the switch. A rectangular slot 132 is provided in corner post 62 to permit the lower curved portion 134 of lever 128 to extend inwardly into the line of the path of the edges of the box blanks comprising lower stack 122. This switch is connected by suitable electrical means (not shown) to motor 96. When lever 128 is urged by the blanks in bottom stack 122 toward switch button 136, pushing the button inwardly, switch 126 opens and motor 96 is stopped. When the lever is permitted to move away from the switch to the dotted line position shown in Fig. 4, switch 126 closes, motor 96 is energized, and feed chains 90 move in the direction indicated by the arrow in Fig. 3.

Optional devices for facilitating feeding of the box blanks are shown in Figs. 3 and 5. These devices comprise fixed dogs 142 and 144 having teeth arranged in a stepwise manner on their forward surfaces. These dogs operate to provide a slight forward stagger to the

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blanks in bottom stack 122 preparatory to their being grasped by the rubber segment of large feed roller 46. Cooperating with these fixed dogs is a third movable dog 146 which also has teeth in its forward surface. This third dog is fixedly secured to a flat bar 152 disposed parallel to but beneath the center guide bar 104 as shown in Figs. 3, 4, and 5. Bar 152 is slidably carried by suitable bearing brackets (not shown) secured to the machine. A lever and gear mechanism designated generally as 156 in Figs. 2 and 3, is cam actuated at 156 to move bar 152 and dog 146 in a reciprocating manner forward and backward. This motion causes movable dog 146 to agitate the box blanks lying in bottom stack 122. This agitation assures that the bottommost blank will be freely associated with the other blanks in the bottom stack and that the blanks will be delivered by feed roll 46 to the other feed rolls 34, 36, and 38 in a steady sequence.

Operation of this feeding device is as follows: Motor 8 is started, causing the various mechanisms of stations A, B, and C to operate. Since no blanks are initially in the magazine, switch 126 is in a closed position and motor 96 is operating to impart motion to feed chains in the direction shown in Fig. 3. Box blanks are then placed in the magazine, the lower edges of these blanks resting on fingers 102 of feed chains 90 in the manner shown in Fig. 6. Due to the spacing between the upper and lower corner posts of the magazine, the blanks in the magazine rest at an inclined position relative to guide bars 104, as shown by upper stack 124. Feed chains 90 carry the box blanks downwardly until the upper edges of the blanks reach lower edges 80 of sides 76 and 78 of upper posts 62 and 64 respectively. Thereupon, as the fingers 102 move further downward, they fall from their inclined position to a more or less horizontal position and stack 122 begins to build up. Simultaneously feed roll 46 grasps the bottommost box blank in stack 122 and urges it forward beneath stop 118 to feed roll 34. This box blank is then propelled forward between secondary feed rolls 32 and 36 which position it upon traveling conveyor chain 52. This chain then carries the box blank forward to the gluing station of the machine.

When the bottom stack has grown sufficiently to displace lever 128 out of slot 132 in corner post 62, the lever pushes against button 136 of switch 126 and opens the switch. This stops motor 96 and feed chains 90. When the lower stack has been depleted by a sufficient amount, lever 128 again moves through slot 132 out of contact with switch button 136, causing the latter to close switch 126. Motor 96 is again energized and additional box blanks are fed from upper stack 124 to the lower stack 122.

As is obvious from the foregoing description, motor 96 is automatically actuated to assure that the size of stack 122 will be maintained constant between upper and lower limits determined by the position and dimensions of lever 128 so that the number of box blanks at any one time will never be great enough to cause undue pressure on the bottommost blank, and hence the rubber segment of the feed roll will easily slide the bottom blank out of the lower stack to start it on its way through the machine.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. Apparatus for feeding cardboard box blanks to a box forming machine, said apparatus having a blank storage section and a blank feeding section, said blank storage section comprising front and rear elements adjustable with respect to each other, said front element comprising a rearwardly inclined face against which the

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front upper ends of said blanks rest, said inclined face extending upwardly a distance to have the upper part thereof vertically over said rear element and terminating at its lower end close to the position of the front end of the lowermost blank, said rear element comprising a chain arranged to move downwardly in parallelism with said inclined face and having thereon a succession of spaced fingers, said chain and each finger adapted to support the rear lower ends of a plurality of blanks with their front upper ends resting against said face, means for automatically causing downward movement of said chain and retraction of the lowermost finger whereby said lowermost blanks will be freed of support by said face and said lowermost finger, thereby to fall to said blank feeding section, said blank feeding section being comprised of blank supporting elements set at an upward slope substantially less than the slope of the blanks in said storage section, and sensing means for causing actuation of said chain moving means whenever the number of blanks in said feeding section falls below a predetermined number and for stopping said chain moving means when sufficient blanks have fallen from said storage section to said feeding section to increase the number of blanks to a predetermined number, and feeding mechanism for removing the blanks in a continuous succession from the bottom of the pile in said feeding section.

2. Apparatus for feeding cardboard box blanks to a box forming machine and in which the said blanks are of relatively thin stock and subject to appreciable bending under their own weight when supported horizontally at their ends only, said apparatus having a blank storage section and a blank feeding section, said blank storage section comprising front and rear elements adjustable with respect to each other whereby the blanks placed therein may be positioned in a sufficiently vertical position to preclude undue bending of the bottom blank, said front element comprising a rearwardly inclined face against which the front upper ends of said blanks rest, said inclined face extending upwardly a distance to have the upper part thereof vertically over said rear element and terminating at its lower end close to the position of the front end of the lowermost blank, said rear elements comprising a chain arranged to move downwardly in parallelism with said inclined face and having thereon a succession of spaced fingers, said chain and each finger adapted to support the rear lower ends of a plurality of blanks with their front upper ends resting against said face and in as vertical position as necessary to prevent bending and falling of the bottom blank from its supported position between said face and said chain and finger, means for automatically causing downward movement of said chain and retraction of the lowermost finger whereby said lowermost blanks will be freed of support by said face and said lowermost finger thereby to fall to said blank feeding section, said blank feeding section being comprised of blank supporting elements set at an upward slope substantially less than the slope of the blanks in said storage section, and sensing means for

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causing actuation of said chain moving means whenever the number of blanks in said feeding section falls below a predetermined number and for stopping said chain moving means when sufficient blanks have fallen from said storage section to said feeding section to increase the number of blanks to a predetermined number, and feeding mechanism for removing the blanks in a continuous succession from the bottom of the pile in said feeding section.

3. Apparatus as set forth in claim 1, said chain actuating means comprising a motor, said sensing means comprising a lever spring urged against the side of the blanks in said feeding section, a switch normally open and closed by movement of said lever in the direction of said blanks as the pile of blanks diminishes thereby to start said motor, said lever adapted to be engaged and pushed away from said blanks by blanks falling from said storage section thereby to open and hold open said switch when sufficient blanks have fallen to restore said pile of blanks to a predetermined number.

4. Apparatus for feeding cardboard box blanks to a box forming machine, said apparatus having a blank storage section and a blank feeding section, said blank storage section comprising front and rear elements adjustable with respect to each other, said front element comprising a rearwardly inclined face against which the front upper ends of said blanks rest, said rear element comprising a chain arranged to move downwardly in parallelism with said inclined face and having thereon a succession of spaced fingers, said chain and each finger adapted to support the rear lower ends of a plurality of blanks with their front upper ends resting against said face, means for automatically causing downward movement of said chain and retraction of the lowermost finger whereby said lowermost blanks will be freed of support by said face and said lowermost finger thereby to fall to said blank feeding section, said blank feeding section being comprised of blank supporting elements set at an upward slope substantially less than the slope of the blanks in said storage section, and sensing means for causing actuation of said chain moving means whenever the number of blanks in said feeding section falls below a predetermined number and for stopping said chain moving means when sufficient blanks have fallen from said storage section to said feeding section to increase the number of blanks to a predetermined number, and feeding mechanism for removing the blanks in a continuous succession from the bottom of the pile in said feeding section.

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