Jan. 14, 1958 O. E. COTE 2,819,898

OSCILLATING FEEDER MECHANISM FOR BOX BLANKS

Filed Aug. 13, 1954 4 Sheets-Sheet 1

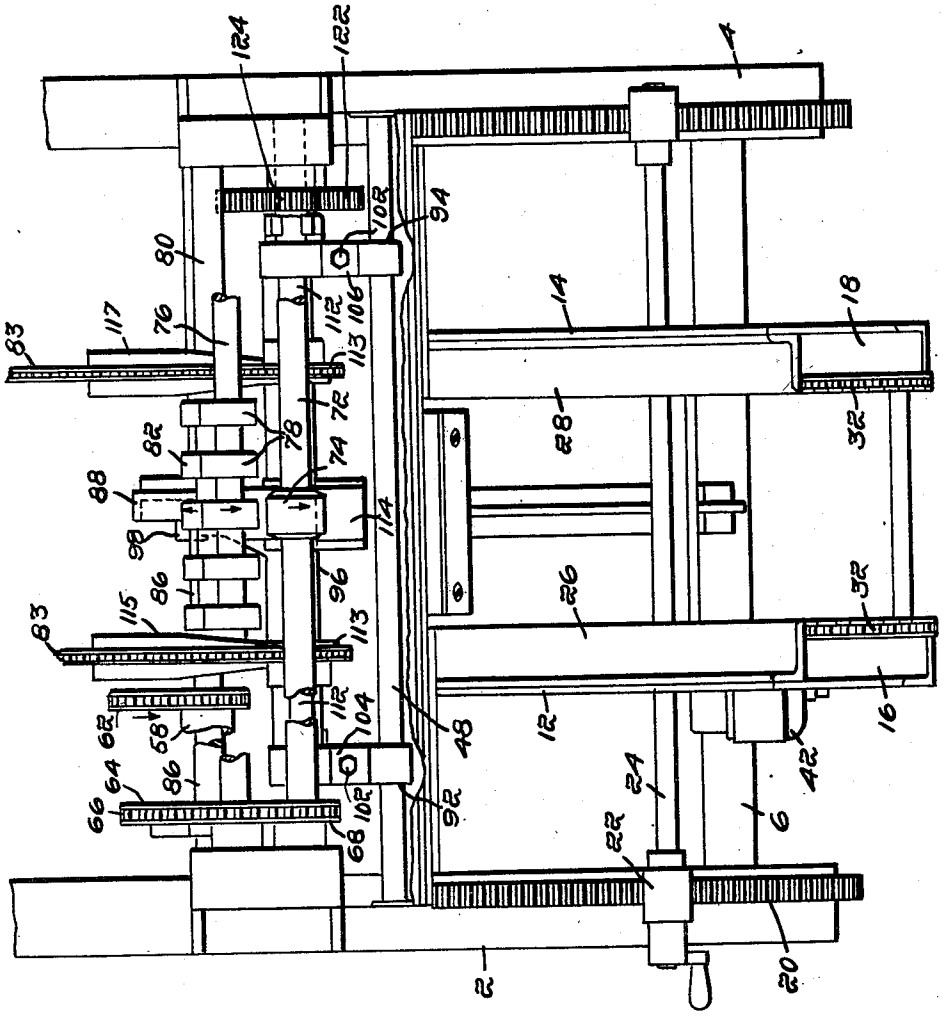

Fig. 1.

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Fig. 2.

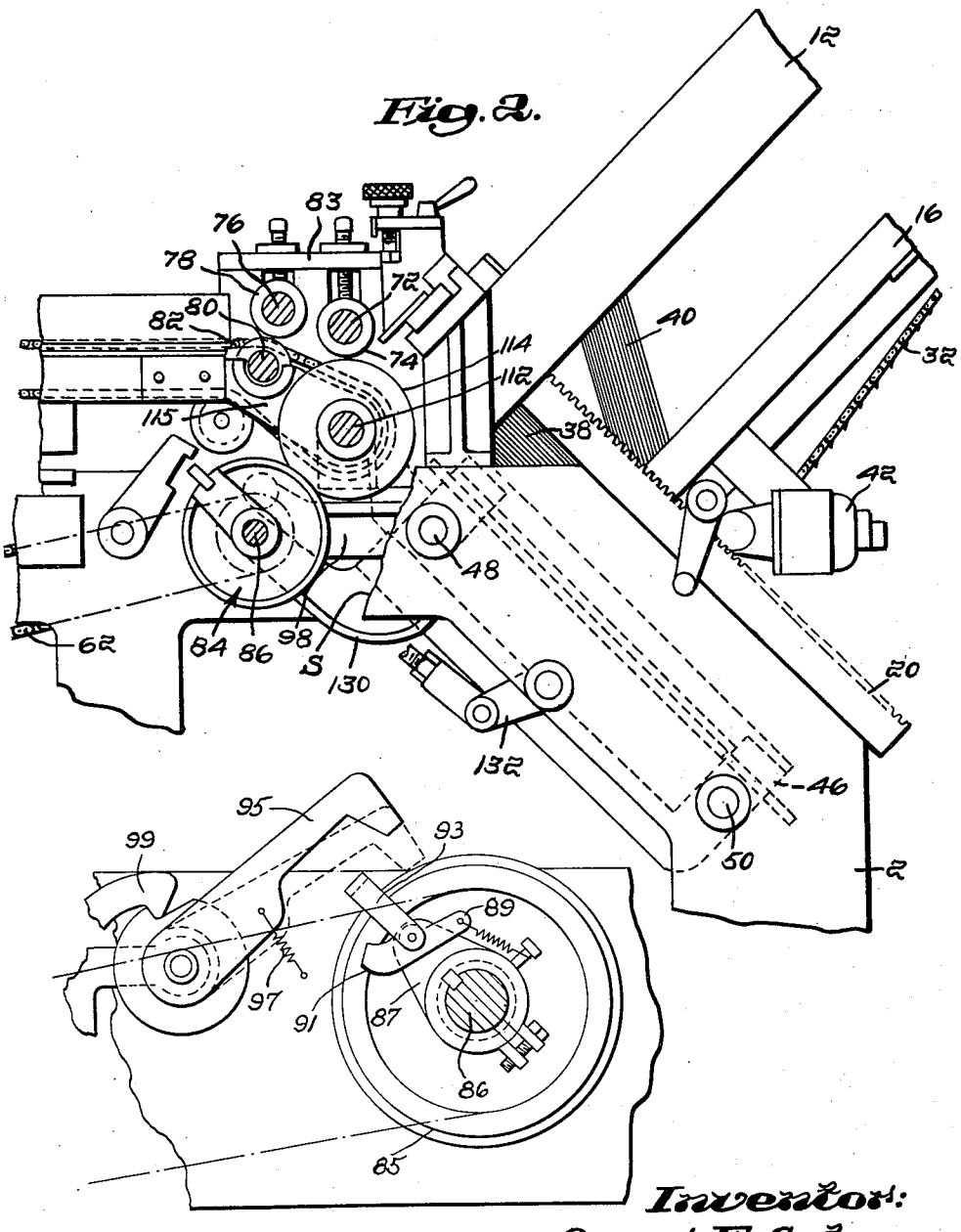

Fig. 2a

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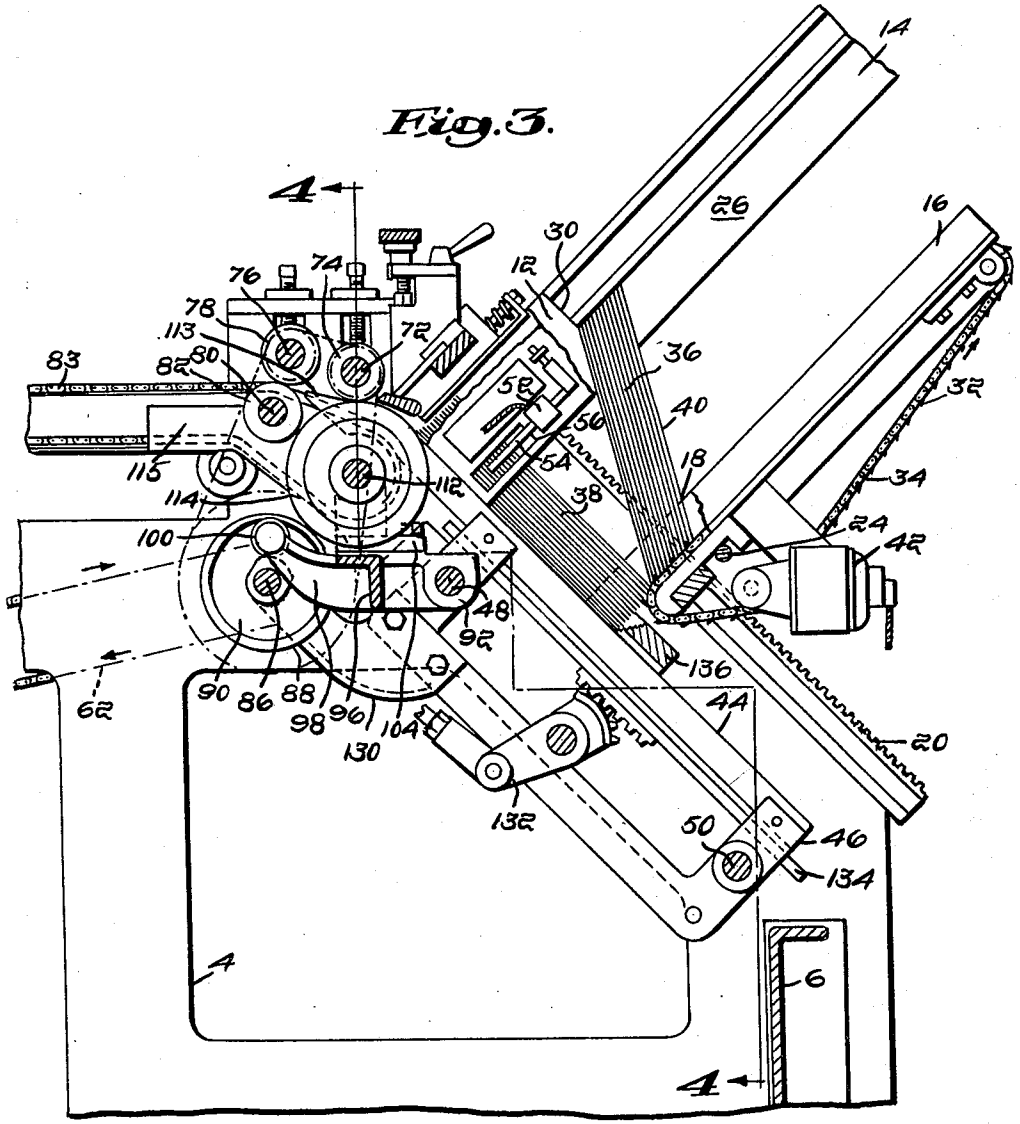
Fig. 3.



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OSCILLATING FEEDER MECHANISM FOR BOX BLANKS

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Fig. 4.

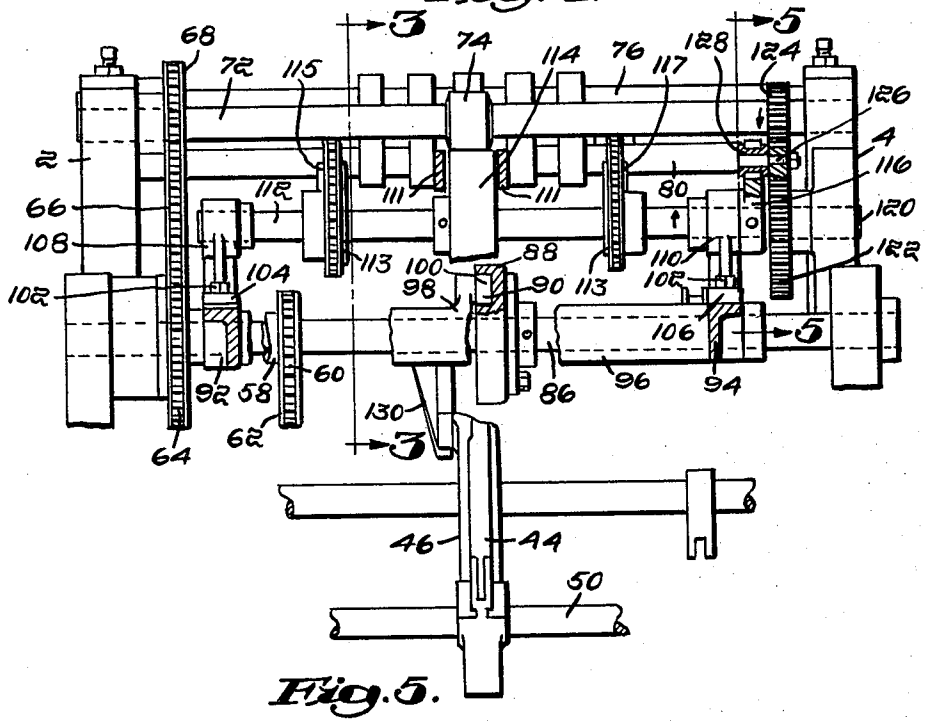
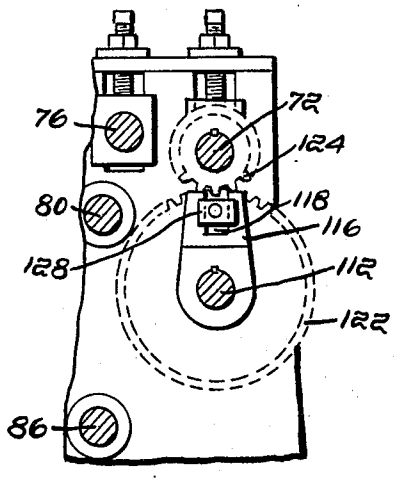


Fig. 5.



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OSCILLATING FEEDER MECHANISM FOR BOX BLANKS

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Application August 13, 1954, Serial No. 449,815

8 Claims. (Cl. 271—41)

This invention relates to box making machinery and is particularly concerned with 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 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 gripped and slid out from under the pile by feeding mechanism to be delivered to the box forming machinery.

Since the box forming machinery operates at a predetermined rate, one requirement of the feeding mechanism is to deliver the blanks from the storage pile at the same rate as completed boxes are conveyed away from the box forming section. If the feeding mechanism operates at a faster rate, the blanks will accumulate at the forming section, jamming the machine and necessitating suspension of operations until the machine has been cleared. On the other hand, operation at a slower rate is inefficient and prevents attainment of maximum production. Accordingly, feeding mechanism must operate in synchronism with the other parts of the machine in order to assure a rapid and even flow of blanks therethrough.

One particular type of feeding mechanism designed to provide a constant flow of blanks is disclosed and described in my co-pending application Ser. No. 409,822, filed February 12, 1954, for Blank Feeder for a Box Making Machine. The feeder disclosed in the aforesaid application comprises a plurality of feed rolls cooperating to remove the bottommost blank from a pile of blanks and to deliver the blank to a conveyor which carries the blank to and through successive sections of the machine. The rate at which the blanks are picked up is determined by a large feed roll provided with a rubber segment over a limited portion of its circumference. The feed roll is positioned so that, upon rotation, the rubber segment will periodically engage the bottommost box blank, remove it from the pile, and direct it to the subsequent feeder mechanism. Since the rubber segment is brought into proximity with the pile only once for each revolution, no blanks are removed from the pile in the interval that the rubber segment is not in proximity with the pile. The speed at which the feed roll rotates necessarily governs the rate at which the rubber segment engages and removes blanks from the pile.

While such an arrangement operates to remove and deliver blanks one at a time at a rapid and constant rate, it has been found that the rubber segment, being repeatedly caused to engage box blanks, is subject to wear to an undesirable degree. If the rubber segment is permitted to wear to excess, so that its thickness is insufficient for it to make contact with the bottommost blank, the feeding mechanism will fail to operate. When this occurs the only solution is to replace the rubber segment or to substitute an entirely new feed roll. This, of course, is objectionable because the machine must be stopped with a consequent loss of production.

Accordingly, an object of this invention is to provide a feeding mechanism for box blanks having a pick-up roll of greater life than a feed roll having a rubber segment as illustrated in the aforementioned copending application.

Another object of this invention is to provide feeding mechanism including a feed roll whose entire surface is utilized at one time or another for engaging and conveying box blanks, thereby increasing the useful life of the roll.

Still another object of this invention is to provide a feeding mechanism incorporating a feed roll, and means for periodically moving the feed roll into and out of engagement with the bottommost blank of a pile of blanks at a predetermined rate, and means for driving said feed roll at a speed varying slightly from a multiple of the rate at which the feed roll is oscillated toward and away from the magazine.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a plan view of the feeding section of a box forming machine embodying the present invention;

Fig. 2 is a side view in elevation of the machine with a portion of the frame broken away to show the relative disposition of parts;

Fig. 2–*a* is a side view in elevation of a specific type of clutch mechanism usable in the present invention;

Fig. 3 is a sectional view in elevation taken along line 3—3 of Fig. 4;

Fig. 4 is a sectional view in elevation taken along line 4—4 of Fig. 3; and

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4.

The blank feeding section illustrated in the drawings conforms substantially, except for certain novel features incorporated therein according to the present invention, to the box feeding stage described and illustrated in the aforementioned copending application Ser. No. 409,822. Those features shown and described in the aforementioned copending application are described hereinafter only to the degree necessary to facilitate comprehension of the structure and operation of the present invention.

Referring specifically to Figs. 1, 2, and 3, the feeding section is supported by vertical frame members 2 and 4 joined by suitable horizontal frame members, such as 6. These frame members preferably comprise parts of the frame of the machine with which the feeding mechanism is associated, e. g., a box forming machine of the type illustrated in the aforementioned copending application Ser. No. 409,822. In Fig. 2 vertical frame member 2 is broken away at S to better illustrate certain features of the feeder mechanism.

The forward end of the feeder section is characterized by a hopper or magazine formed of four angle iron posts 12, 14, 16, and 18, secured to the frame of the machine. The two lower posts 16 and 18 are movable toward and away from each other by a conventional rack 20 and pinion 22 operated by crank spindle 24. By this arrangement the hopper is adapted to receive box blanks of various sizes.

Sides 26 and 28 of upper posts 12 and 14 terminate at 30 as illustrated in Fig. 3. Riding on suitable sprockets mounted on lower posts 16 and 18 are feed chains 32 provided with lugs or fingers 34 adapted to engage the lower edges of the box blanks 36 of upper stack 40. The upper edges of the blanks in pile 40 rest against

sides 26 and 28 of upper posts 12 and 14. A motor 42 drives feed chains 32 in the direction shown by the arrows in Fig. 3.

At the bottom of the magazine are a plurality of guide bars 44 received by supports 46 mounted by fixed shafts 48 and 50 extending through frame members 2 and 4. Guide bars 44 support the blanks in pile 38.

Mounted on the outside of upper corner post 12 is a switch 52 actuated by a lever 54 pivoted to swing toward and away from switch 52. Lever 54 is normally urged by suitable spring means (not shown) away from switch 52 and when in that position, switch 52 is closed. A rectangular slot 56 is provided in post 12 to permit the lower portion of lever 54 to extend inwardly into the line of path of box blanks comprising pile 38. Switch 52 is electrically connected to motor 42.

When lever 54 is urged by the blanks in pile 38 toward switch 52, the latter opens and motor 42 is stopped. When lever 54 is free to move away from switch 52, due to the absence of box blanks in pile 38, switch 52 closes, motor 42 starts, and feed chains 32 are caused to move in the direction illustrated in Fig. 3 to feed additional box blanks from pile 40 to pile 38. As the conveyor moves the bottommost blank in pile 40 past the end 30 of sides 26 and 28 of upper posts 12 and 14, the lowermost blank falls into pile 38. When sufficient blanks have accumulated in pile 38, lever 54 is again forced by the blanks toward switch 52 to open the latter and stop motor 42.

The foregoing structure is all described in detail in the aforementioned copending application Ser. No. 409,822.

The bottommost blank is delivered out of pile 38 resting on guide bars 44 by feeding mechanism constructed according to the present invention. The feeder mechanism includes a hollow shaft 58 carrying a sprocket 60 driven by a chain 62 from a motor (not shown). Shaft 58 carries a second sprocket 64 which operates through a drive chain 66 and a gear 68 to drive a shaft 72 carrying a small feed roll 74. Shaft 72 is journaled in side frame members 2 and 4 and operates through suitable gears (not shown) to drive shafts 76 and 80 carrying feed rolls 78 and 82 respectively in the direction indicated by the arrows in Fig. 3.

Hollow shaft 58 comprises an integral extension of a clutch shown generally at 84 (Fig. 2), which when engaged causes shaft 58 to drive shaft 86. Shaft 58 surrounds shaft 86 and is freely rotatable thereon when clutch 84 is disengaged. Clutch 84 is preferably of the type shown and described in the copending application of John Fradenburgh, Ser. No. 420,023, filed March 31, 1954, for Feeder Control for Box Making Machine; but any other clutch of appropriate design may be substituted therefor. Fig. 2–*a* illustrates in more detail a clutch of the type shown and described in the aforesaid application Ser. No. 420,023. As shown in Fig. 2–*a*, the clutch comprises a drum 85 formed integral with shaft 58, an arm 87 keyed to shaft 86, a spring-biased pawl 89 pivotally mounted on arm 87 and normally residing in a notch 91 on the interior surface of drum 35, whereby shaft 86 is locked to the drum and shaft 58 and rotates therewith, a lever 93 attached to the pawl 89, and a pivotal clutch-actuating arm 95 having a hooked end adapted to engage lever 93 to disengage the pawl from the notch, whereby to disengage the clutch. A spring 97 urges arm 95 toward drum 85; however, hooked arm 95 normally is held out of engagement with lever 93 by means of a latch lever 99, only a portion of which is shown in Fig. 2–*a*. When latch lever 99 is actuated out of engagement with arm 95, the latter is pulled clockwise by spring 97. When arm 95 is rotated clockwise its hooked end will be engaged by lever 93 as the latter rotates with arm 87, causing the pawl 89 to be swung out of the notch 91 to disengage the clutch. So long as arm 95 and lever 93 are engaged, the clutch will

remain disengaged and shaft 86 will remain stationary. It is to be understood that latch lever 99 may be actuated to release position either manually or automatically by electrically operated means upon failure of the machine to deliver completed boxes in accord with normal functioning. However, regardless of the means utilized to actuate latch lever 99, and regardless of where in its circle of rotation lever 93 is at the moment latch lever 99 is actuated to release arm 95, the latter will always engage lever 93 at the same point (approximately 11 o'clock position in the illustrated embodiment), at which point cam follower 100 is in that part of the cam track 90 that causes the feed roll 114 to be in down position. Cam track 90, cam follower 100 and feed roll 114 are described hereinafter.

Shaft 86 is journaled in side frame members 2 and 4 and carries intermediate its ends a cam wheel 88 having a cam track 90. Rotatably associated with shaft 48 by means of supporting arms 92 and 94 is an angle iron bar 96. Bar 96 runs parallel to shaft 48 and is provided intermediate its ends with a curved arm 98. A rotatable cam follower 100 is caried at the end of arm 98 and rides within cam track 90.

Secured to supporting arms 92 and 94 by means of bolts 102 are two brackets 104 and 106 provided with upstanding arms 108 and 110 respectively. Journaled in the ends of arms 108 and 110 is a shaft 112 carrying primary feed roll 114. Feed roll 114 is centered between fixed box blank supports 111 and has a continuous surface of rubber or some other material suitable for engaging and moving a box blank.

Idler sprockets 113 which cooperate with sprockets 81 on shaft 80 to support and facilitate movement of conveyor chains 83 are not carried by shaft 112. Instead sprockets 113 are mounted on the end of extensions 115 and 117 and have axial openings therethrough large enough to provide for appreciable transverse movement of shaft 112. Conveyor chains 83 are driven by means (not shown) and operate to direct blanks from the feeder mechanism to the machine with which the mechanism is associated.

Affixed to the right hand end of shaft 112 is an arm 116 provided with a rectangular slot 118. Rotatably carried by a stub shaft 120 extending inwardly from side frame 4 is a gear element 122 which meshes with and is driven by a gear 124 mounted on shaft 72. A small shaft 126 extends through gear 122 at a point removed from its axis and carries a rectangular block 128 which is slidably positioned in rectangular slot 118. Block 128 and rectangular slot 118 form a loose connection between gear 122 and arm 116 so that as gear 122 is caused to rotate, arm 116 is driven by gear 122 no matter what the position of shaft 112 as determined by cam 88. Cam 88 acts to oscillate bar 96 and shaft 112 forward and away from the magazine for each revolution of shaft 86.

An important feature of this invention is that the gear ratios are so adjusted that the number of revolutions of feed roll 114 per unit of time deviates slightly from an exact multiple of the number of revolutions of cam wheel 88. This is accomplished, for example, by providing gear 122 with one tooth more or less than the number of teeth required to drive shaft 112 at a rotational velocity equal to an exact multiple of the rotational velocity of shaft 86.

As a result, initial engagement with successive bottommost blanks in the magazine is made sequentially at many different transverse lines of engagement (hereinafter referred to as points of engagement) on the periphery of roll 114 instead of at only one line of engagement as would be the case if the speed of feed roll 114 was an exact multiple of that of cam wheel 88. The points on the surface of roll 114 at which initial engagement is made with the blanks in the magazine on successive oscillations of shaft 112 will shift in one direction or the other about the periphery of the roll according to whether the number of teeth on gear 122 is more or less than the num-

ber of teeth required to drive roll 114 at a rotational speed equal to a multiple of the speed of cam 88. By virtue of the aforementioned sequential shifting of the transverse line of engagement the surface of roll 114 is caused to wear evenly about its entire circumference, thereby greatly lengthening the life of the feed roll surface.

An arm 130 secured at one end to support bracket 46 and carrying at the other end shaft 86, adds additional support to the latter shaft intermediate its ends to prevent it from being flexed by the thrust exerted thereon in opposition to the force exerted by cam wheel 88 on cam follower 100 and its supporting arm 98 as the cam follower rides over the high spot on the cam track 90.

A second cam (not shown) is mounted on shaft 86 and acts through a lever and gear mechanism generally indicated at 132 to move a bar 134 carrying dog 136 in a reciprocating manner forward and backward. On its rearward stroke, i. e. from right to left, Fig. 3, dog 136 agitates the blanks in lower pile 38 so that the bottommost blank will be moved out of alinement with the blanks above it in the direction of feed roll 114, bringing it into position to be picked up by the roll and delivered to feed rolls 74, 78 and 82 in a steady sequence.

Operation of the feeding mechanism is as follows: Assuming that a sufficient supply of blanks is assembled in pile 38 and that clutch 84 is engaged so that shaft 86 is being driven by shaft 58 acting through the clutch, feed rolls 74, 78 and 82 turn in the direction indicated in Fig. 1 by virtue of chain 66 (Fig. 4) operating between sprockets 64 and 68 and mounted on shafts 58 and 72 respectively and the gear mechanism (not shown) operating between shaft 72 and shafts 76 and 80.

Shaft 72 operates through gear 124 to drive gear 122. The latter gear operates through the loose connection provided by rectangular block 128 slidably positioned in rectangular slot 118 of arm 116 to drive shaft 112 carrying the primary feed roll 114. Simultaneously shaft 86 rotates cam wheel 88 and as the high point of the cam track 90 reaches cam follower 100, the latter is caused by the high spot in the track to rotate arm 98 clockwise as seen in Fig. 3. As arm 98 moves clockwise it causes bar 96 to move in the same direction, and since shaft 112 is fixedly supported on brackets 104 and 106 carried by arms 92 and 94 associated with bar 96, the feed roll is caused to move in the same clockwise direction about the pivot point provided by shaft 48 and is brought into contacting position with the bottommost blank in pile 38. Due to the choice of gear ratios, initial engagement with successive blanks in the magazine is made at different points on the surface of feed roll 114.

At about the same time the cam on shaft 86 (not shown) causes the lever and gear mechanism 132 to move dog 136 toward feed roll 114. Dog 136 pushes the bottommost blank toward feed roll 114 and the latter picks up the blank and directs it toward feed rolls 74, 78 and 82. The blank passes between feed rolls 78 and 82 on to conveyor 83 which directs the blanks in a steady sequence to subsequent stages of the machine. When the high spot of cam track 90 moves on beyond cam follower 100, the feed roll 114 moves downwardly, pivoting again about shaft 48. In its lowered position feed roll 114 will be out of engagement with the blanks in the magazine as the blanks cannot fall below the position of the two supports 111 and 113 that are fixedly located on opposite sides of the feed roll. These supports are so adjusted that when the feed roll is in blank-engaging position, the surface of the feed roll will be above the upper faces of the supports. Conversely, when the feed roll is in downmost position, as determined by cam track 90, the surface of the feed roll will be below the supports and hence necessarily out of engagement with the bottommost blank.

If for some reason clutch 84 is disengaged, the four rolls will continue to operate until the motor driving chain 62

is deenergized. If clutch 84 is decoupled while the feed rolls are still rotating, no blanks will pass out of pile 38 into the machine since feed roll 114 will be in its lowered position. This is due to the fact that disengagement of the clutch is timed with respect to the subsequent at rest position of cam track 90 so that the cam follower 100 is in that part of the cam track that causes the feed roll to be in down position.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. Therefore, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts specifically described or illustrated, and that within the scope of the appended claims it may be practiced otherwise than as specifically described or illustrated.

I claim:

1. A feeder mechanism comprising a frame, a magazine for storing flat blanks supported on said frame, a feed roll, means for rotatably supporting said feed roll, means for rotating said feed roll, means secured to said frame for pivotally carrying said feed roll supporting means, a cam follower carried by said feed roll supporting means, a cam shaft having a cam affixed thereto rotatably carried by said frame, said cam and said cam follower being in engaging relation, means for rotating said cam shaft, whereby said cam acts through said cam follower and said feed roll supporting means to oscillate said feed roll supporting means about its pivot to repeatedly bring said feed roll into and out of engaging relation with blanks stored in said magazine, said cam maintaining said feed roll in said engaging relation for an interval of time sufficient to remove at least one blank from said magazine, and means for terminating rotation of said cam at a point whereat said feed roll is out of engaging relation with the blanks stored in said magazine.

2. A feeder mechanism of the type defined by claim 1, wherein said means for terminating rotation of said cam acts independently of said means for rotating said feed roll.

3. A feeder mechanism comprising a frame, a magazine for storing flat blanks supported on said frame, a feed roll, means for rotatably supporting said feed roll, means for rotating said feed roll, means secured to said frame for pivotally carrying said feed roll supporting means, a cam follower carried by said feed roll supporting means, a cam shaft having a cam affixed thereto rotatably carried by said frame, said cam and said cam follower being in engaging relation, means for rotating said cam shaft whereby said cam acts through said cam follower and said feed roll supporting means to oscillate said feed roll supporting means about its pivot to repeatedly bring said feed roll into and out of engaging relation with blanks stored in said magazine, said cam maintaining said feed roll in said engaging relation for an interval of time sufficient to remove at least one blank from said magazine, and means for driving said feed roll rotating means, said driving means acting upon said feed roll rotating means through a loose sliding connection so as to maintain feed roll rotation while said feed roll is being repeatedly moved into and out of engaging relation with blanks stored in said magazine.

4. A feeder mechanism comprising a frame, a magazine for storing flat blanks supported on said frame, a feed roll, means for rotatably supporting said feed roll, means secured to said frame for pivotally carrying said feed roll supporting means, a cam follower carried by said feed roll supporting means, a cam shaft having a cam affixed thereto rotatably carried by said frame, said cam and said cam follower being in engaging relation, means for rotating said cam shaft, whereby said cam acts through said cam follower and said feed roll supporting means to oscillate said feed roll supporting means about its pivot to repeatedly bring said feed roll into and out of engaging relation with blanks stored in said magazine, said

cam maintaining said feed roll in said engaging relation for an interval of time sufficient to remove at least one blank from said magazine, a rotating driving element mounted on a fixed axis, a rotatable driven element connected to and acting to cause rotation of said feed roll, the axis of rotation of said driven element movable in accord with the movement of said feed roll supporting means, and means providing a slidable connection between said driving and driven elements to transmit rotational power from one to the other continuously regardless of the shifting position of the axis of said driven element.

5. A feeder mechanism for delivering box blanks to a box-forming machine at a predetermined rate comprising in combination, a magazine for storing box blanks, two spaced parallel frame members supporting said magazine, a first shaft rotatably supported by said frame members, a cam wheel carried by said first shaft and rotatable therewith, said cam wheel having a cam track in one face thereof, a second shaft surrounding said first shaft in concentric rotatable relation thereto, means for driving said second shaft, a normally engaged clutch coupling said shafts together whereby said cam wheel rotates in synchronism with said second shaft, said clutch being disengageable only at a predetermined point in the arc of rotation of said first shaft, a pair of arms, means rotatably supporting said arms between said frame members, a third shaft rotatably journaled in said arms, a feed roll fixed to said third shaft, said third shaft being positioned beneath said magazine adjacent its forward edge, a bar secured to said arms extending parallel to said first, second and third shafts, a third arm carried by said bar extending toward said first shaft, a cam follower rotatably carried by said third arm at its free end, said cam follower riding within said cam track, said cam track having a high spot and a low spot, said feed roll being cammed into engagement with the bottommost blank in said magazine when said follower is riding on said high spot and cammed out of engagement with said bottommost blank when said follower is riding on said low spot, said feed roll being repeatedly moved toward and away from said magazine as said cam wheel continues to rotate, a first gear, means driving said first gear from said second shaft, a second gear driven by said first gear, and means carried by said third shaft slidably coupled to said second gear for driving said third shaft by way of said second gear.

6. A feeder mechanism as defined by claim 5, wherein said cam wheel is so positioned on said first shaft that said cam follower is in engagement with said low spot when said first shaft is brought to rest upon disengagement of said clutch.

7. A feeder mechanism as defined by claim 5, wherein said second gear is provided with a rectangular block, said rectangular block being rotatable relative to said second gear, and said third shaft is provided with an arm having a rectangular slot therein, said rectangular block being slidably positioned within said slot whereby to provide said slidable coupling between said third shaft and said second gear.

8. A feeder mechanism comprising a frame, a magazine for storing flat blanks supported on said frame in an inclined position whereby the leading edges of the box blanks in said magazine are at a higher level than their trailing edges, a feed roll located below said magazine with at least a portion of said feed roll being located at all times in advance of said magazine and the leading edges of the box blanks stored therein, means for rotatably supporting said feed roll, means secured to said frame for pivotally carrying said feed roll supporting means, a cam follower carried by said feed roll supporting means, a cam shaft having a cam affixed thereto rotatably carried by said frame, said cam and said cam follower being in engaging relation, means for rotating said cam shaft, whereby said cam acts through said cam follower and said feed roll supporting means to oscillate said feed roll supporting means about its pivot to repeatedly bring said feed roll into and out of engaging relation with the leading edge of the bottommost blank in said magazine, said cam maintaining said feed roll in said engaging relation for an interval of time sufficient to remove the bottommost blank from said magazine, a rotating driving element mounted on a fixed axis, a rotatable driven element connected to and acting to cause rotation of said feed roll, the axis of rotation of said driven element being movable in accord with the movement of said feed roll supporting means, means coupling said driving and driven elements to transmit rotational power from one to the other continuously regardless of the shifting position of the axis of said driven element, means located below said magazine at the rear thereof for moving the bottommost blank forward out of said magazine into position to be picked up by said feed roll, and means located above said feed roll in front of said magazine cooperating with said feed roll to deliver successive blanks picked up by said feed roll forward out of said feeder mechanism.

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