

[54] **STACKER**

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[58] Field of Search **93/93 DP; 271/63, 271/68, 75, 76, 49, 50, 77, 78**

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[57]

ABSTRACT

An apparatus for automatically providing a gap or space in the movement of one or more files of carton blanks conveyed in a shingled relation on a delivery conveyor to an infeed conveyor or a carton blank stacker or similar carton handling device, the apparatus including a first member positioned in a transverse relation to the direction of travel of the file of carton blanks to engage the files and momentarily stop or hold the blanks while the speed of the infeed conveyor is increased to provide a gap in the file. The gap in the file of shingled carton blanks should be of sufficient length to allow for removal of the carton blanks stacked in the stacker. The first member can take the form of a clamp or brake shoe, a catch plate, or a gripper wheel. Continuously driven drive wheels can be provided to remove any loose, skewed or canted blanks gripped between the first and second members and to feed the carton blanks into the stacker.

30 Claims, 7 Drawing Figures

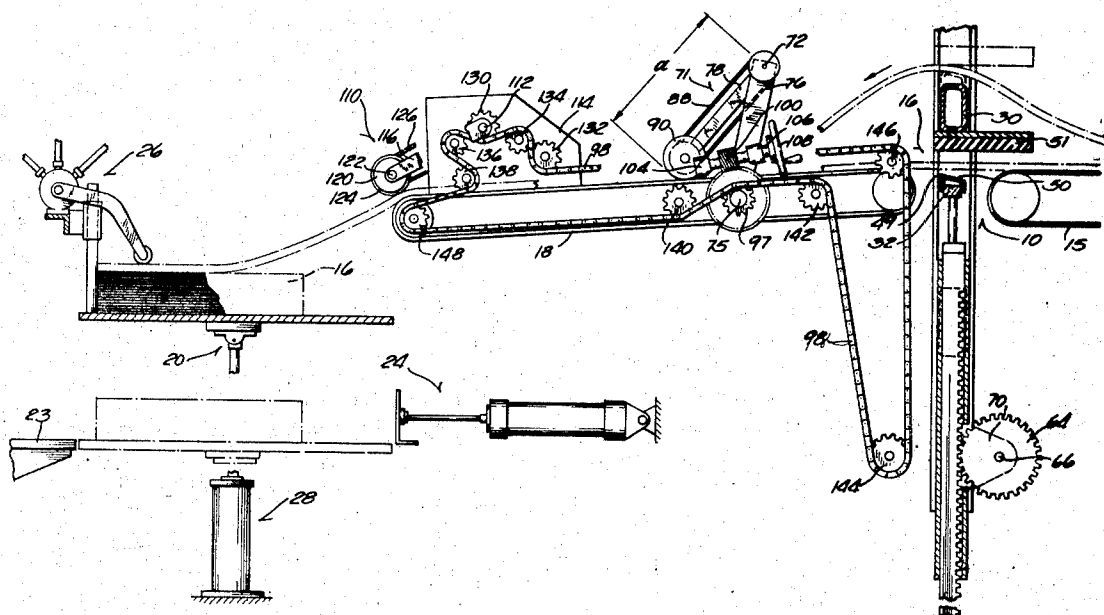


Fig. 1

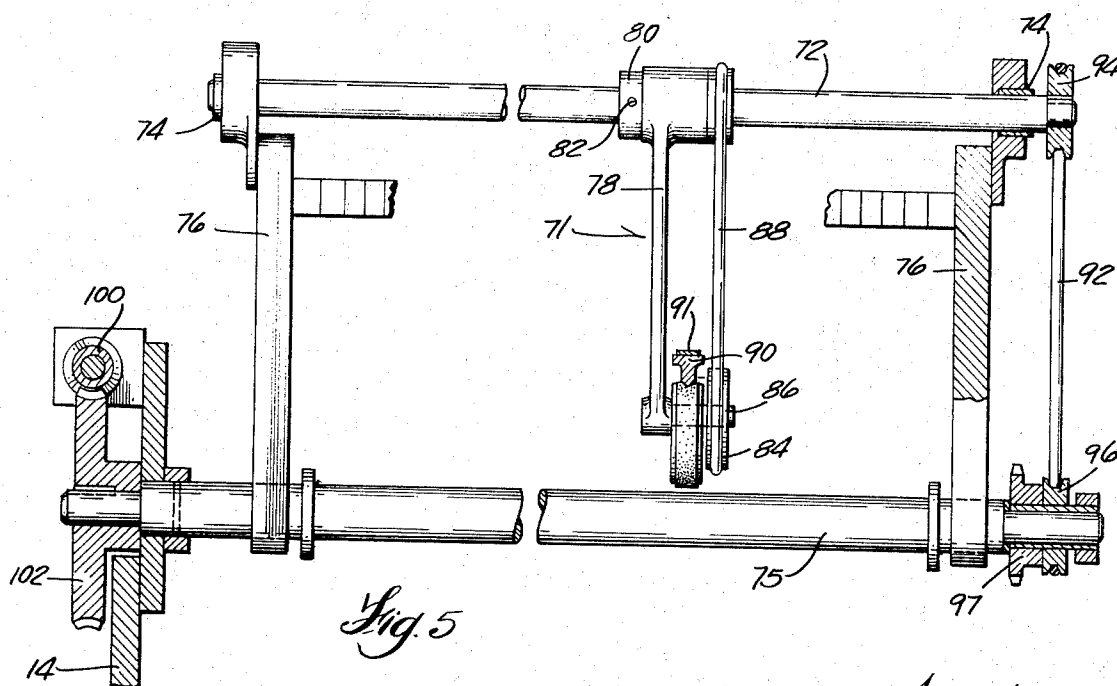
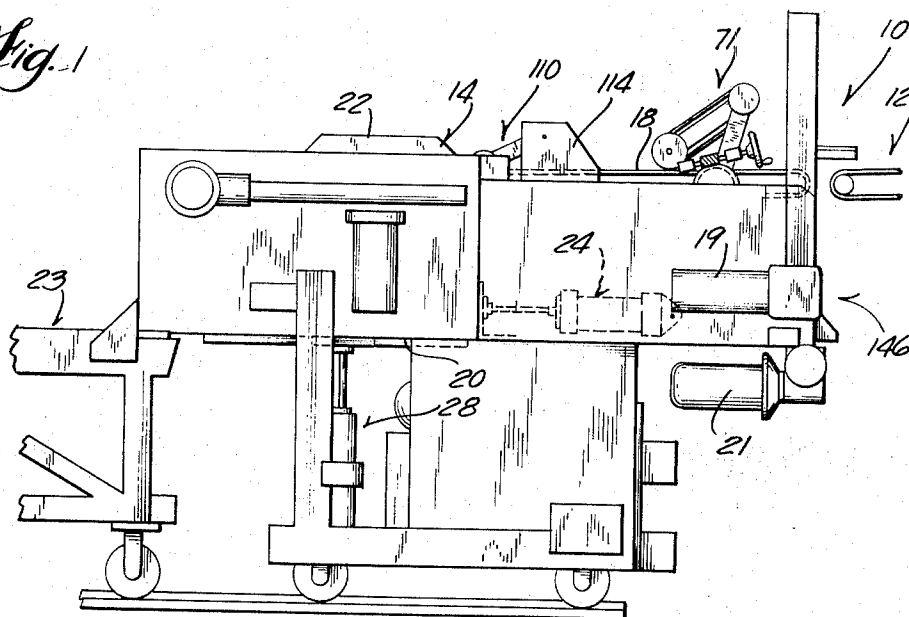
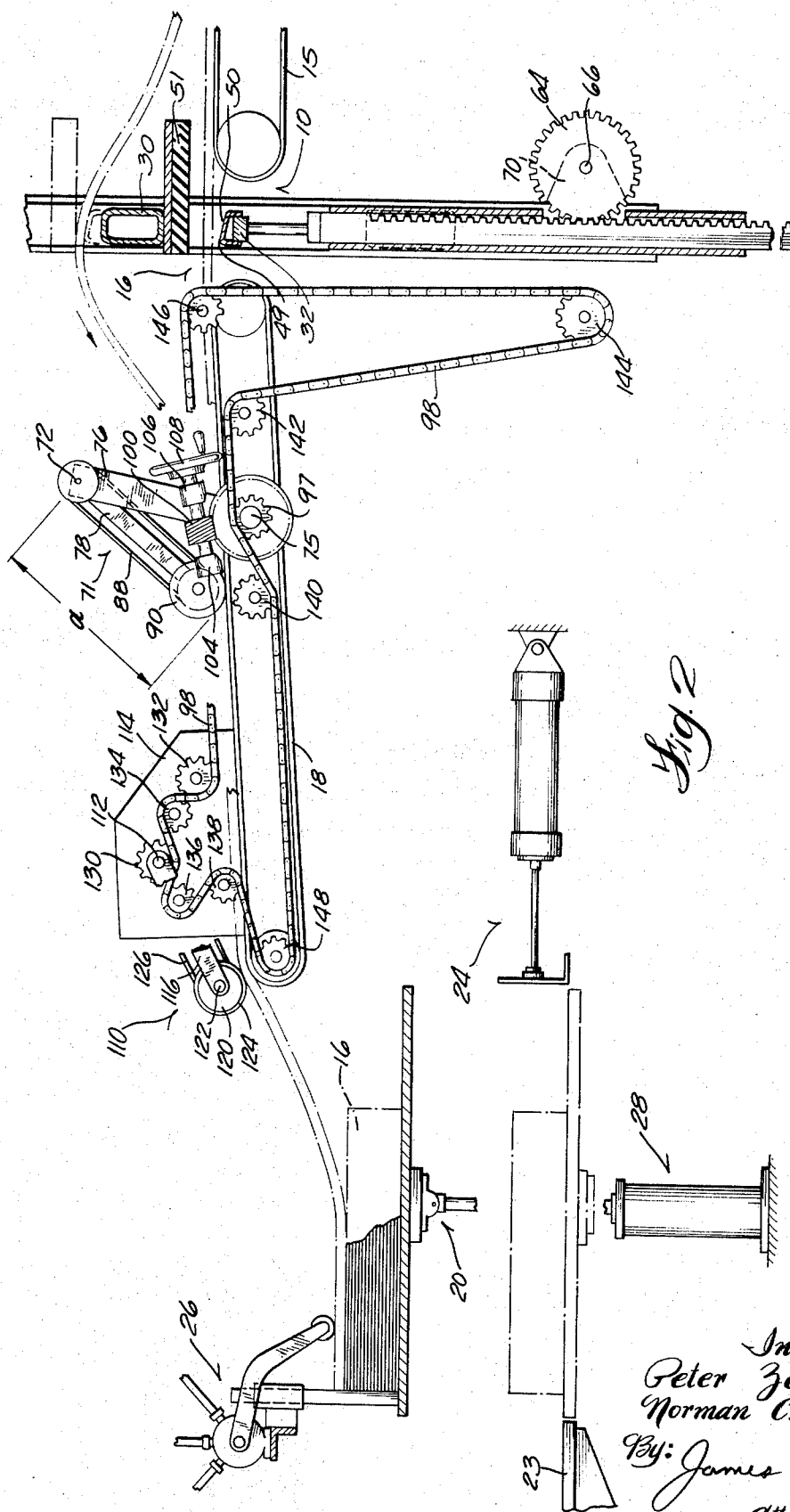


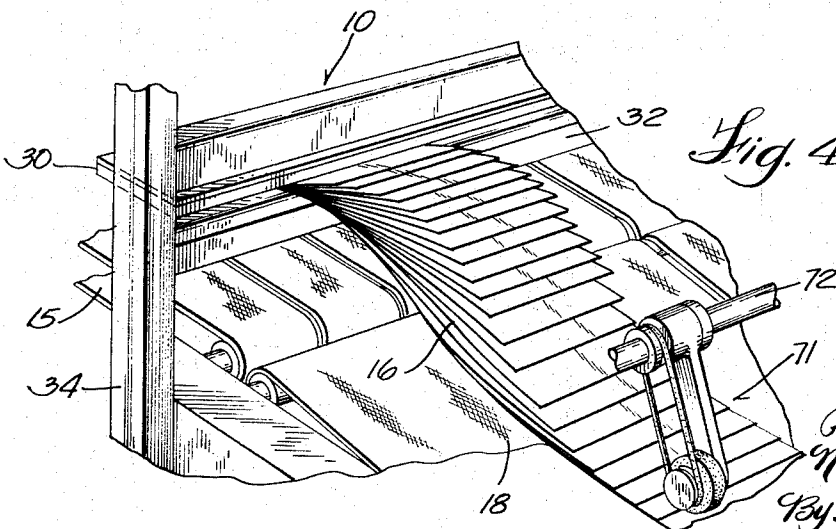
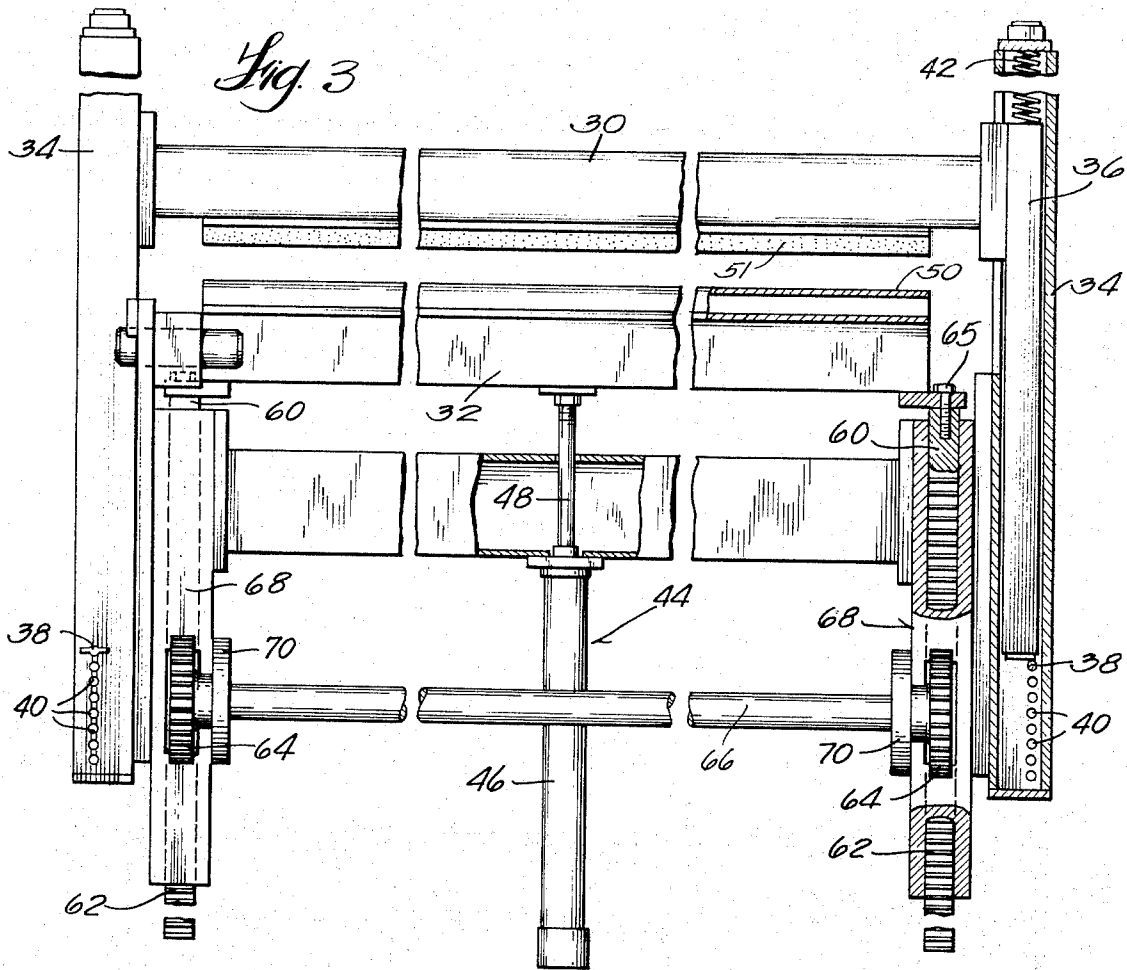
Fig. 5

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Fig. 6

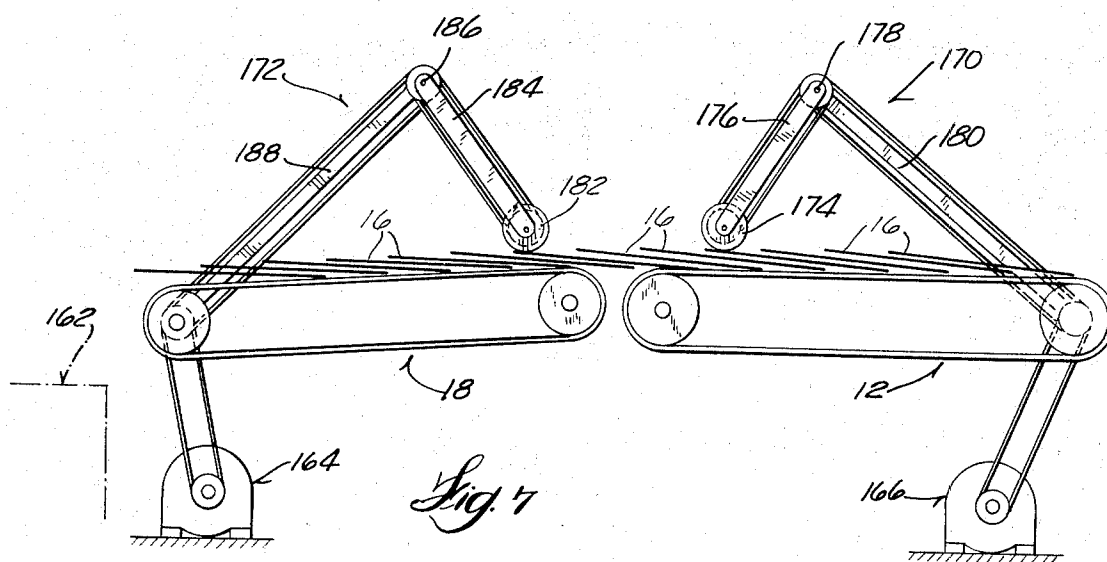
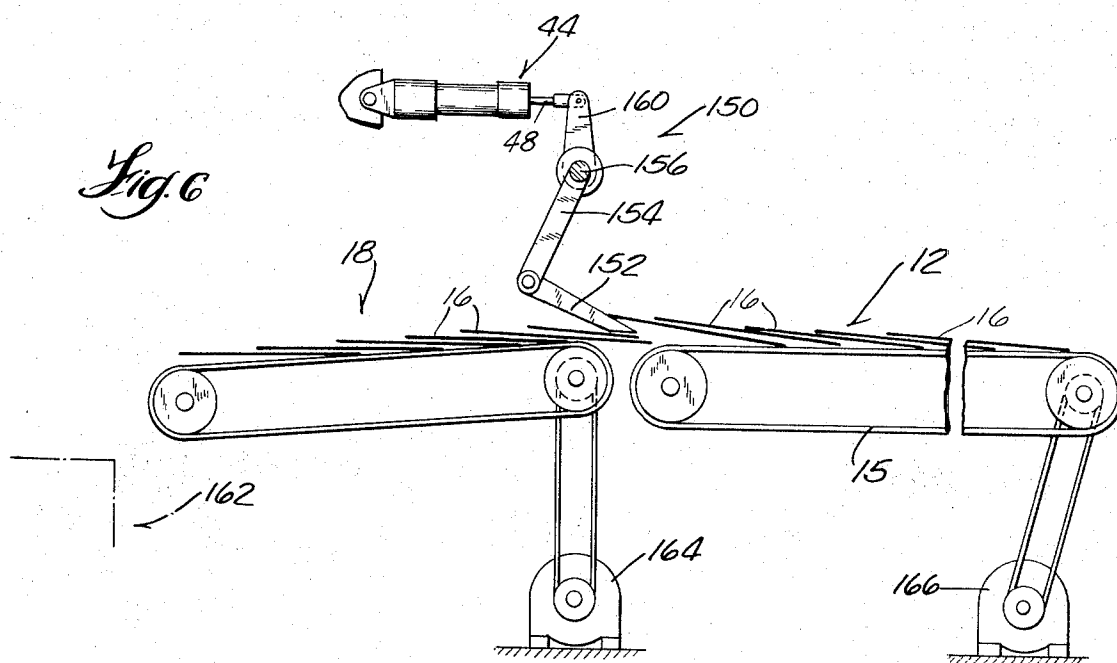


Fig. 7

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STACKER

BACKGROUND OF THE INVENTION

Carton blank stackers of the type contemplated herein are positioned at the end of a discharge conveyor of a carbon blank cutting, scoring, and/or printing machine. The carton blanks are usually conveyed from the machine in a shingled relation, and a stacker is used to automatically stack the cartons for shipment. Once the cutting, scoring and printing machine has been started, it is run continuously and as a consequence the carton blanks are conveyed continuously to the stacker. Separation of the file of shingled carton blanks on the conveyor to allow for the removal of a stack of carton blanks from the stacker has conventionally been accomplished by means of a number of flat swords. The swords are moved into the stack of carton blanks on the stacker to support the incoming carton blanks and the stack of carton blanks below the swords are lowered and removed from the stacker. These swords often cause considerable damage to the carton blanks in the stack due to the engagement of the swords with the cuts and/or openings in the blanks. If there is printed matter on one surface of the blanks, the swords tend to scratch or mar the printed surface of the blanks. When blank thickness varies from one file to another, some files will accumulate extra cartons in the stack portion that remains above the swords, eventually choking the stacker. Similarly, other files will become depleted of cartons above the swords causing poor jogging action. This results in large counting errors and an undesirable amount of operator attention to equalize the stacking levels from file to file.

SUMMARY OF THE INVENTION

The apparatus of the present invention is used to momentarily stop the movement of a section of a file of shingled carton blanks on a conveyor to provide a gap therein of sufficient length to allow for the removal of a stack of carton blanks from the stacker. This can be achieved by using a brake bar, catch plate assembly or gripper wheel assembly to engage the carton blanks on the delivery conveyor while the blanks downstream are rapidly moved into the stacker. The brake bar or clamp assembly can be moved into clamping engagement with the shingled carton blanks to raise the clamped carton blanks off of the conveyor to allow the carton blanks on the conveyor to bunch up evenly behind the clamp assembly while the carton blanks following the assembly are rapidly removed from the stacker.

The clamp assembly includes a first or upper cross member which is biased downwardly toward the file of carton blanks on the conveyor. A second or lower cross member is positioned below the file of carton blanks on the conveyor and is hydraulically moved upward toward the upper cross member to clamp the carton blanks therebetween. The upper cross member is free to move upward with the lower cross member to prevent the carton blanks on the conveyor from moving over the top of the upper cross member.

The catch plate assembly includes an angularly disposed plate supported on pivotally mounted arms above the conveyor. The arms are rotated to move the catch plate to an angularly disposed position with respect to the conveyor. The carton blanks on the delivery conveyor will ride up on the catch plate while the

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blanks downstream of the catch plate are moved rapidly into the stacker.

The gripper wheel assemblies include one set of gripper wheels located at the end of the delivery conveyor and a second set of gripper wheels located at the beginning of the infeed conveyor. Both sets of wheels are driven at the same speed as the corresponding conveyor and are located to provide positive separation of the carton blanks in each file when the infeed conveyor is increased in speed.

A carton blank pulling device can be provided on the stacker to prevent jamming or clogging of the stacker by a loose, canted or skewed carton blank held by the clamp assembly. Since the spacing between the carton blanks may be irregular, the clamp assembly may grab only a portion of the last carton blank so that it is loose or skewed in the clamp assembly. On release from the clamp assembly to start a new stack, any skewed or canted carton blank will jam the stacker. The carton blank pulling device provides for the positive movement of the carton blanks when released from the clamp assembly and thereby prevents jamming or clogging of the stacker.

THE DRAWINGS

FIG. 1 is a side view in elevation showing a portion of a discharge conveyor and a stacker having an infeed conveyor spaced from the discharge conveyor, the carton blank clamp assembly of the present invention being shown positioned in the space between the two conveyors;

FIG. 2 is an enlarged view of portions of the stacker and the clamp assembly showing the clamp assembly in the open position in solid lines and in the closed position in dotted lines, certain parts being shown in section or broken away;

FIG. 3 is a front elevation view of the clamp assembly, certain parts being shown in section or broken away;

FIG. 4 is a perspective view of a portion of the clamp assembly shown closed and elevated with the carton blanks shown feathered on the downstream side of the clamp assembly;

FIG. 5 is a front view of the carton pulling drive wheel assembly showing one of the drive wheels, certain parts being shown in section or broken away;

FIG. 6 is a side view in elevation of an alternate apparatus for separating the carton blanks in a file of carton blanks;

FIG. 7 is a side view in elevation of another apparatus for separating the carton blanks in a file of carton blanks.

DESCRIPTION OF THE INVENTION

The clamp assembly 10 of this invention as seen in FIGS. 1 and 2 is used in combination with a carton blank delivery conveyor 12 and a stacker 14 as a means for providing a gap or space in the file of carton blanks by stopping the movement of a file of carton blanks 16 on the end of the delivery conveyor. This gap should be of sufficient duration to allow for the removal of the stack of carton blanks 16 from the stacker 14 before the blanks 16 held by the clamp assembly 10 are released for movement onto the stacker 14. The delivery conveyor 12 includes one or more belts 15 and is commonly found at the discharge end of a cutting, scoring and/or printing machine. The carton blanks 16 emerge

from the machine and are carried by the conveyor 12 in a shingled relation to the stacker 14. One or more files of carton blanks 16 may be conveyed on the delivery conveyor 12 at one time. Generally a counter is provided on the machine to indicate the number of blanks 16 which have been cut, scored, and/or printed and deposited on the conveyor 12.

THE STACKER

The carton blank stacker 14 shown in FIGS. 1 and 2 of the drawings is also of a conventional type having an infeed single belt conveyor 18, an elevator 20, a set of jogging or vibrating plates 22, a stack removing pusher plate assembly 24, and a stack height control assembly 26. The infeed conveyor 18 is positioned at the end of the delivery conveyor 12 in a spaced relation thereto to transfer carton blanks 16 from the delivery conveyor 12 to the elevator 20. The infeed conveyor 18 is driven at a normal speed by means of a motor 19 and at high speed by means of a high speed motor 21 provided on the frame of the stacker 14. Although two motors are shown for driving the infeed conveyor, the infeed conveyor can also be driven by means of a variable speed drive motor. The jogging plates 22 vibrate the carton blanks 16 as they drop onto the elevator 20 to form a vertical stack on the elevator 20.

The height of the elevator 20 is continuously changed as the level of the stack increases so that the top of the stack is positioned just below the delivery conveyor 12. This is accomplished by means of the stack height control assembly 26 which is connected to control a number of hydraulic piston and cylinder assemblies 28 which are used to support the elevator 20, as is well known in the art. When the stack of carton blanks 16 on the elevator 20 reaches the desired height, the stacker 14 is run through an unloading cycle to remove the stack from the elevator 20. Briefly, this involves the actuation of a limit switch to operate the down solenoid valve for the hydraulic assemblies 28 to drop the elevator 20 to the bottom of the stacker 14. The elevator closes a limit switch to actuate the pusher plate assembly 24 to push the stack of carton blanks 16 off the elevator 20 onto a table or conveyor 23. The return motion of the pusher plate assembly 24 is used to close the limit switch for the elevator up solenoid valve to move the elevator back to a position adjacent the infeed conveyor 18. Although a jogging type stacker is shown in the drawings, it should be apparent that other types of stackers can be used with the clamp assembly of this invention.

CARTON BRAKE BAR OR CLAMP ASSEMBLY

In accordance with one aspect of the invention, the brake bar or clamp assembly 10 is positioned at the end of the delivery conveyor 12 to momentarily grip or clamp the carton blanks 16 when a stack of carton blanks is to be removed from the stacker 14. The clamp assembly 10 stops the movement of the carton blanks 16 at the end of the delivery conveyor 12 by displacing the carton blanks from the file for a period of time sufficient to allow for the removal of the stack of carton blanks from the elevator 20. Normally, this would be for a period of approximately 3 to 5 seconds. The carton blanks 16 are held as seen in FIG. 4 in a separated or feathered position to allow the carton blanks on the downstream side of the clamp assembly to move freely from the clamp assembly.

The clamp assembly 10 as seen in FIGS. 2 and 3 generally includes a first or an upper cross member or bar 30 positioned transversely above the carton blanks 16 on the delivery conveyor 12 and a second or lower cross member or bar 32 positioned below the carton blanks on the delivery conveyor 12. The upper cross member 30 is supported by means of a pair of legs or rods 36 positioned in hollow square posts 34 secured to each side of the frame of the stacker 14. The cross member 30 is connected to the legs or rods 36 which are positioned within the posts 34 for vertical movement with respect to the conveyor 12. The cross member 32 is connected to bars 60 which are positioned for vertical movement in hollow square posts 68.

Means are provided for selectively adjusting the height of the cross bar 30 to accommodate the carton blanks 16 which stack up on the delivery conveyor 12 when the clamp assembly 10 is closed. Such means is in the form of a number of pins 38 which are adapted to be inserted into holes 40 provided in the posts 34. The rods 36 are biased downward against the pins 38 by means of springs 42.

Means are provided for moving the lower cross member 32 into abutting relation to the upper cross member 30 to grip or clamp the carton blanks 16 at the end of the delivery conveyor 12. Such means is in the form of a hydraulic piston and cylinder assembly 44 which includes a cylinder 46 connected to the frame of the stacker 14 and a piston rod 48 connected to the cross member 32. The piston and cylinder assembly 44 is controlled by a solenoid actuated control valve as is generally understood in the art. The cycle of operation of the clamp assembly 10 can be initiated by an electric signal provided by the counter on the cutting, scoring and/or printing machine, a selectively positionable stack height limit switch positioned to be engaged by the elevator 20, or a manual unload switch, as described hereinafter. The upward movement of the cross member 32 is used to actuate a limit switch assembly which is connected to control the solenoid valve for assembly 44 and to actuate a time delay relay for the high speed conveyor motor 21.

Means are provided for supporting said first cross bar 30 for movement with said second bar 32 to prevent the carton blanks 16 from bunching up behind the clamp assembly to a height where they pass over the top of the cross member 30 while the clamp assembly 10 is closed. It should be noted that stopping the movement of the carton blanks 16 at the end of the delivery conveyor 12 will cause the carton blanks 16 on the conveyor belts 15 to stack up behind the clamp assembly 10. If the carton blanks stack up to a height higher than the cross member 30, the carton blanks will spill over the top of the cross bar. This is prevented by means of the movement of the upper cross member 30 which moves upward with the lower cross member 32 to a height where the carton blanks 16 bunch up on the delivery conveyor 12. As seen in FIG. 3, the legs 36 are connected to each end of the cross member 30, and are free to move upward within the square posts 34 against the bias of springs 42. When the clamp assembly 10 is opened, the upper cross member 30 will follow the motion of the lower cross member 32 until the bars 36 engage the pins 38.

The distance between the upper cross member 30 and the top of the conveyor belts 15 can be varied to accommodate the contemplated height of the carton

blanks 16 which bunch up on the delivery conveyor 12. This is accomplished by means of the pins 38 and holes 40 provided on each of the tubular support posts 34. In this regard, the pins 38 can be positioned in any one of the row of holes 40 which are spaced at one-half inch intervals.

Means are provided for maintaining the lower cross member 32 in a fixed or constant relation with the conveyor 12 to assure an even amount of pressure across each file of carton blanks 16 across the conveyor 12. Such means is in the form of the pair of bars 60 each having a row of ratchet teeth 62 on one side and a pair of gears 64 secured to each end of a rod 66. The bars 60 are connected to each end of the lower cross member 32 by screws 65 and are positioned for vertical movement in the hollow square guide posts 68 mounted on the frame of the stacker 14. The rod 66 is journaled for rotation in brackets 70 provided on the guide posts 68 so that the motion of one of the gears 64 will produce an equal motion in the other of the gears 64. Whenever one of the bars 60 moves, the motion of the bar 60 is transferred to the other bar 60 through the gears 64 and rod 66.

Positive gripping or clamping of the carton blanks 16 between the cross members 30 and 32 is provided by means of an angle plate 50 provided on the top of the cross member 32 and a pad 51 provided on cross bar 30. The angle of the pinch of the plate 50 is designed to raise the loose ends of the carton blanks 16 which are squeezed between the upper and lower cross members 30 and 32. In this regard, as the lower cross member plate 50 is pushed into the cushion 51 there is a tendency for the carton blanks to tilt to the angle of plate 50 thus raising the outer or loose end of the carton blanks off of the conveyor 18. The forward edge 49 of the plate 50 is rounded to cause the blank to warp because of the nip between the plate 50 and the pad 51. The pressure or nip must be maintained along the length of the carton blank in order to prevent the carton blank from coming loose in the clamp assembly after the clamp assembly 10 has been raised above the conveyor 12.

CARTON BLANK PULLING DEVICE

In the event that a carton blank 16 on the downstream side of the clamp assembly 10 is not grasped tightly by the cross bars 30 and 32, the blank 16 may become canted or skewed slightly with respect to the other carton blanks in the clamp assembly. On release of a canted blank 16, the blank 16 will jam the stacker 14 if turned at an angle which is too great to be handled by the vibrating or jogging plates 22. This is prevented by providing means for drawing or pulling the loose or canted carton blank 16 from the clamp assembly. Such means comprises a number of rubber wheel drive assemblies 71 as seen in FIGS. 2, 4, and 5 provided on the conveyor 18 for the stacker 14.

In this regard, and referring to FIG. 4, it should be noted that the outer ends of the carton blanks 16 when clamped in the clamp assembly 10 hang loosely in a separated or featured relation on the downstream side of the clamp assembly. The drive assemblies 71 are located at a distance from the clamp assembly 10 slightly less than the length of the carton blank 16. If a blank is loose or skewed, it will then be engaged by the drive wheel assembly and pulled therefrom.

Each of the assemblies 71 is mounted on a common drive shaft 72 which is journaled for rotation in bearings 74 provided in support plate arms 76. The support arms 76 are secured to a support shaft 75 pivotally mounted on the frame of the stacker 14. Each of the assemblies 71 includes a link 78 pivotally mounted on a pulley 80 secured to the drive shaft 72 by a screw 82. A second pulley 84 is mounted for rotation on a pivot pin 86 located at the other end of the link 78 and is connected to the first pulley by a belt 88. A drive wheel 90 having a rubber friction belt 91 on its outer surface is secured to the second pulley 84 in a position to ride on the conveyor 18. Means are provided for driving the drive shaft 72 in the form of a V-belt 92 mounted on a pulley 94 provided on shaft 72 and a pulley 96 journaled on the end of support shaft 75. The pulley 96 is connected to a sprocket 97 which is driven continuously by means of the drive chain 98 for the infeed conveyor 18 as described below.

The distance of the drive roller 90 from the end of the clamp assembly 10 is adjusted by means of a screw 100 and gear 102 provided on the end of shaft 75. In this regard, the gear 102 is secured to the end of the shaft 75. The screw 100 is journaled for rotation in bearing blocks 104 and 106 provided on the stacker conveyor 18. A hand crank 108 is secured to the end of the screw 100. It should be noted that the distance a from the periphery of the drive wheel 90 to the axis of shaft 72 is greater than the distance from the axis of shaft 72 to the surface of the conveyor 18 when the support arms 76 are perpendicular to the conveyor 18. With this arrangement, the drive wheel 90 will always be located on the downstream side of the arms 76 as the support arms are pivoted about shaft 75. The belt 88 also provides a means for directing the blanks 16 downwardly toward the drive wheel 90. As seen in FIG. 2, the loose ends of any carton blank that happens to extend outward from the clamp assembly 10 will engage the belt 88. Since the belt 88 is moving downward, it will direct the end of the carton blank toward the drive wheel 90.

The drive wheel 90 is positioned to ride on conveyor 18 in the line of travel of one of the files of carton blanks 16 and at a distance from the clamp assembly 10 substantially equal to the length of a carton blank 16. If a carton blank 16 is skewed or canted it will extend outward from the clamp assembly a distance greater than the length of a carton blank 16 and will be engaged by the wheel 90. Since the wheel 90 is driven continuously, it will pull any loose or canted blank 16 out of the clamp assembly 10. Any securely held carton blank will be pulled backward from under the wheel by the clamp as it raises.

FEED OR DRIVE WHEEL ASSEMBLY

The carton blanks 16 are fed directly into the jogging plates 22 by means of a number of positively driven drive wheel assemblies 110 provided on the end of the infeed conveyor 18. Each of the drive wheel assemblies 110 is pivotally supported on a drive shaft 112 journaled for rotation in support plates 114 which are secured to each side of the stacker 14. Each assembly includes a link 116 pivotally mounted on a pulley similar to pulley 80 which is secured to the shaft 112. A second pulley 120 is supported on a pin 122 secured to the other end of link 116 and a drive wheel 124 similar to

wheel 90 is secured to the pulley 120. The second pulley 120 is connected to the pulley 118 by a belt 126.

The drive shaft 72 for the drive wheel assemblies 71 and the drive shaft 112 for the drive wheel assemblies 110 are both driven by means of the infeed conveyor drive chain 98. In this regard, the drive sprocket 97 is secured to pulley 96 on shaft 75 and a drive sprocket 130 is secured to the drive shaft 112. Idler sprockets 132, 134, 136, and 138 are provided on support plate 114 to guide the chain 98 around drive gear 130. Idler sprockets 140 and 142 are provided on each side of sprocket 97 to guide the chain 98 around sprocket 97. The drive chain 98 is trained around a drive sprocket 144 driven by means of motors 19 and 21, an idler sprocket 146, the idler sprockets 132 and 134, drive sprocket 130, idler sprockets 136 and 138, conveyor drive sprocket 148, idler sprocket 140, drive sprocket 97, idler sprocket 142 and back to drive sprocket 144. It should be noted that the direction of peripheral motion of the conveyor 18 and the drive wheels 90 and 124 is always in the same direction.

The speed of the infeed conveyor 18 is increased to rapidly clear the carton blanks 16 from the stacker by means of high speed motor 21. In this regard, the high speed motor 21 is connected to the drive gear 144 by a conventional overrunning clutch assembly 146. As soon as the clamp assembly 10 reaches the upper position with the carton blanks 16 gripped tightly therein, the infeed conveyor 18 as well as the drive wheel assemblies 71 and 110 are speeded up to clear the infeed conveyor rapidly.

CATCH PLATE ASSEMBLY

Referring to FIG. 6, an alternate means is shown for providing a gap in the files of carton blanks 16 being conveyed on a delivery conveyor 12 to an infeed conveyor 18. Such means is in the form of a catch plate assembly 150 mounted above the conveyor 12 for movement into engagement with the files of carton blanks 16. In this regard, the catch plate assembly 150 includes a plate 152 supported by lever arms 154 for pivotal movement about pivot shaft 156. The pivot shaft 156 can be rotated by a hydraulic cylinder assembly 44 as described above. The piston 48 being connected to a lever arm 160 connected to the shaft 156 as is generally understood. The hydraulic cylinder assembly 44 can be actuated by any known counter system to move the plate 152 into engagement with the carton blanks on the file.

Separation of the carton blanks 16 in the file to produce a gap of sufficient duration to clear the stacker magazine 162 is aided by increasing the speed of the infeed conveyor 18. This is accomplished by means of a variable speed motor 164 connected to drive the conveyor 18. The variable speed motor 164 normally operates at the same low speed as the drive motor 166 for the delivery conveyor 12. The variable speed motor 164 is switched to high speed operation at about the same time as the plate 152 engages the carton blanks 16. The infeed conveyor 18 is driven at an accelerated speed for a short period of time to move the carton blanks 16 on the conveyor 18 rapidly into the stacker magazine 162.

GRIPPER WHEEL ASSEMBLY

In FIG. 7, another means is shown for providing a gap in the files of carton blanks 16. Such means is in the

form of a pair of gripper wheel drive assemblies 170, 172 which are operatively connected to be driven at the same speed as the corresponding conveyors 12 and 18. In this regard, the drive wheel assembly 170 includes a number of resilient friction wheels 174 which can be similar to the wheel assemblies 71 described above. Wheels 174 are mounted on the ends of arms 176 which are connected to a shaft 178 supported by arms 180. The wheels 174 are driven in the same direction as the conveyor 12 and at the same speed off of the drive motor 166. The drive wheel assembly 172 includes a number of resilient wheels 182 mounted on arms 184 which are secured to a shaft 186 secured to support arms 188. The wheels 182 are driven in the same direction and at the same speed as conveyor 18 by a variable speed motor 164.

The carton blanks 16 on the conveyor 18 are separated from the carton blanks on the conveyor 12 by means of the motor 164 which is operated at high speed to increase the speed of the conveyor 18. The carton blanks on conveyor 18 will be moved at a high speed into the stacker thus creating a gap between the last blank on the conveyor 18 and the next blank on delivery conveyor 12. The gripper wheel assembly 170 will continue to operate at the same speed as conveyor 12 and the gripper wheel assembly 172 will operate at the same speed as the conveyor 18. The gripper wheels 174 will prevent or positively hold the carton blanks 16 on the conveyor 12 in the file until the blanks 16 clear the wheel 174. The gripper wheels 182 will increase in speed with conveyor 18 assuring that the blanks do not slip on the conveyor 18 as the speed of conveyor 18 increases.

THE OPERATION (FIGS. 1 AND 2)

Unloading of a stack of carton blanks from the elevator 20 of the stacker 14 follows a conventional cycle of operation. The down solenoid valve for the elevator 20 is actuated by an electric signal to move the elevator to a down position. A normally open limit switch for the pusher plate assembly 24 is closed by the final downward motion of the elevator 20 to actuate a pusher plate extension solenoid valve to push the stack off of the elevator 20 onto the table or conveyor 23. When the pusher plate reaches the end of its stroke, a limit switch is closed to actuate the pusher plate return solenoid to retract the pusher plate. The final movement of the return motion of the pusher plate is used to close a limit switch to actuate the up solenoid for the elevator 20. The final motion of the elevator 20 is used to re-actuate the height control assembly 26. The cycle of operation of the stacker 14 can vary depending on the type of stacker being used, however, regardless of the type of stacker used, a control signal must be provided in order to initiate an unloading cycle.

Prior to initiating the unloading cycle for the stacker 14, the carton blanks 16 on the conveyors are stopped to allow time to unload the stack of carton blanks. This is accomplished by the clamp assembly 10. The cycle of operation for the clamp assembly 10 can be initiated by means of a signal provided by the machine counter, a stack height limit switch on the elevator 20 or by a manual switch. The signal from any one of these sources is used to actuate the up solenoid valve for the hydraulic assembly 44 and to close a relay for a holding circuit for the unloading cycle for the stacker 14. The lower cross member 32 is moved upward by the hy-

hydraulic assembly 44 pushing the carton blanks 16 against the upper cross member 30. Both members 30 and 32 continue to move upward until they reach their upper position, as described above. The final motion of the cross member 32 is used to actuate the limit switch assembly which has a first switch to actuate a time delay relay, a second switch to open the circuit to the up solenoid valve for assembly 44, and a third switch to start the high speed conveyor motor 21. The high speed motor 21 drives the conveyor 18 at high speed to move the carton blanks 16 which are still on the infeed conveyor 18 rapidly into the stacker 14.

The time delay relay, at the end of the preset time period, performs four functions: a) opens a limit switch for the high speed motor 21 stopping high speed operation; b) opens a limit switch for the height control assembly 26; c) closes the limit switch for the down solenoid valve for the hydraulic assembly 44; and d) provides the signal to start the unloading cycle for the stacker 14. The conveyor 18 should be clear at the end of the preset time period.

The final return motion of the elevator 20 is used to actuate a limit switch assembly that includes limit switches for: a) opening the holding circuit for the unloading cycle; b) opening the circuit for the time delay relay; and c) closing a circuit for the height control assembly.

At approximately the same time that the elevator 20 reaches its upper position, the carton blanks which were released from the clamp assembly 10 will start to drop onto the elevator 20. If an infeed conveyor for the stacker is not used, the clamp assembly 10 should be left in the upper position at least until the elevator up solenoid is actuated on the return movement of the elevator 20. The clamp assembly 10 will then open and release the carton blanks directly onto the elevator 20.

RESUME

The clamp assembly 10 described herein provides a simple but effective means for delaying the movement of a file of carton blanks while a stack of the carton blanks is being removed from the stacker. Elevating of the carton blanks during the delay period prevents the bunched up carton blanks from moving over the top of the clamp assembly and at the same time maintaining the carton blanks in an orderly arrangement behind the clamp assembly.

The carton blank pulling device reduces the possibility of jamming of the stacker. This is achieved by removing any loose or canted carton blanks from the clamp assembly. The carton blank pulling device is provided with a positive drive so that it operates at the same speed as the infeed conveyor to the stacker.

We claim:

1. A carton blank clamp apparatus for separating a file of carton blanks being conveyed in a shingled relation on conveyor to a device downstream from the conveyor, said apparatus comprising,

a first member positioned above said blanks and in a transverse relation to the direction of travel of said blanks, and

means for raising said carton blanks to a position in abutting relation to said first member to clamp said carton blanks in a hanging and feathered relation over the device and thereby stop the motion of the carton blanks on the conveyor and allow the blanks on the downstream side of the first member to fall

freely onto the device downstream from the conveyor.

2. The apparatus according to claim 1 wherein said raising means comprises a second member positioned below said blanks in a transverse relation thereto and being mounted for movement into engagement with said first member.

3. The apparatus according to claim 2 including means for maintaining said second member in a fixed relation with respect to the conveyor.

4. The apparatus according to claim 1 including a resilient cushion on said first member and an angle plate on said second member positioned to engage said resilient cushion.

5. The apparatus according to claim 1 including means for selectively setting the height of said first member with respect to the conveyor.

6. The apparatus according to claim 1 including means for supporting said first member for movement with said raising means.

7. The apparatus according to claim 6 including means for biasing said first member towards said raising means.

8. The apparatus according to claim 1 including means for pulling loose or canted carton blanks clasped between said first member and said raising means.

9. The apparatus according to claim 8 wherein said pulling means comprises a drive wheel assembly supported at a distance from said moving means equal to slightly less than the length of one of the carton blanks.

10. The apparatus according to claim 9 including means for adjusting the position of said drive wheel assembly with respect to said raising means.

11. The combination of a carton blank stacker having an infeed conveyor, a delivery conveyor for conveying carton blanks in a shingled relation to said infeed conveyor, and an apparatus positioned between said infeed conveyor and said delivery conveyor for gripping carton blanks in the gap between the conveyors to allow a stack of carton blanks to be removed from said stacker, said apparatus comprising means for clamping the carton blanks at the end of the delivery conveyor and elevating the clamped portions of the blanks above said delivery conveyor whereby the clamped carton blanks will hang in a feathered relation over the infeed conveyor allowing the carton blanks downstream from said clamping means to drop freely onto the infeed conveyor.

12. The combination according to claim 11 including means for adjusting the height of said first member with respect to said blanks.

13. The combination according to claim 11 wherein said clamping means comprises a second cross member positioned in a transverse relation below said blanks.

14. The combination according to claim 13 including means for maintaining the second cross member in a predetermined relation to the top of the delivery conveyor.

15. A carton blank clamp assembly for stopping the motion of a number of carton blanks being conveyed in a shingled relation on a conveyor to a carton blank stacker, said assembly comprising,

a first cross bar positioned above the blanks in a transverse relation to the direction of motion of said blanks,

and means for moving said carton blanks into engagement with said first cross bar to clamp the car-

ton blanks in a hanging position at the end of the conveyor whereby the carton blanks in the clamp assembly are held in a feathered relation over the input end of the stacker.

16. The clamp assembly according to claim 15 including means for adjusting the height of said first cross bar relative to said conveyor to accommodate the carton blanks which stack up behind the clamp assembly when the clamp assembly is closed on the conveyor.

17. The clamp assembly according to claim 15 including means for maintaining the second cross bar in a predetermined relation to the top of the conveyor.

18. The clamp assembly according to claim 15 including means for allowing said first cross bar to move upwardly with said second cross bar.

19. The clamp assembly according to claim 15 including means for pulling carton blanks from said clamp assembly which are not securely held by said clamp assembly.

20. A carton blank pulling device mounted on an infeed conveyor for removing loose or skewed carton blanks clamped in a clamp assembly located at the end of a delivery conveyor having a number of files of carton blanks arranged in a shingled relation thereon, said device comprising a drive wheel assembly corresponding to each of said files of carton blanks, each of said assemblies including a drive wheel for engaging any carton blanks extending outward from the assembly a distance nominally equal to or less than the length of a carton blank,

and means for driving said assembly at the same speed as the infeed conveyor.

21. The carton blank pulling device according to claim 20 including means for adjusting the distance of the drive wheel assembly from the clamp assembly.

22. The combination according to claim 11 including means for increasing the speed of the infeed conveyor.

23. The combination according to claim 11 including means for positively moving carton blanks from the infeed conveyor to the stacker.

24. The combination according to claim 23 wherein said moving means includes a number of drive wheel assemblies mounted at the discharge end of the infeed conveyor and positioned to ride on the surface of said

carton blanks.

25. In combination, a carton blank stacker having an infeed conveyor,

a delivery conveyor for continuously conveying files of carton blanks in a shingled relation to said infeed conveyor,

and means for holding said files at the end of said delivery conveyor in a feathered relation over said infeed conveyor for a sufficient duration to allow for the removal of the stacks of carton blanks from said carton blank stacker before the next carton blanks are conveyed to the stacker.

26. The combination according to claim 25 wherein said holding means comprises a clamp assembly having a cross bar positioned above said delivery conveyor and means for moving said blanks into engagement with said cross bar to momentarily stop the motion of the carton blanks on the end of the delivery conveyor.

27. The combination according to claim 25 including means for operating said infeed conveyor at a greater speed than the delivery conveyor.

28. The combination according to claim 11 including a machine counter connected to actuate the clamping means.

29. Carton blank handling apparatus for separating a file of carton blanks which are being conveyed along a path and in overlapping shingled relationship to one another, said apparatus comprising, means for shifting said file of shingled blanks vertically so as to dispose a portion of said file of blanks in a hanging and feathered relationship where the blanks in said portion hang and are separated from one another at their rear ends in respect to the direction of travel, and clamping means for causing said file of carton blanks on the downstream side of said shifting means in respect to the direction of travel along said path to be momentarily retarded in their movement, and thereby cause said hanging blanks to separate from said file.

30. The apparatus according to claim 29 including a delivery conveyor and an infeed conveyor, said apparatus being located at the end of said delivery conveyor whereby said clamped carton blanks overhang said infeed conveyor.

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