Sept. 29, 1959 H. L. McWHORTER ET AL 2,906,529

FEEDER FOR CARTON AND THE LIKE MATERIAL

Filed Aug. 14, 1956 3 Sheets-Sheet 1

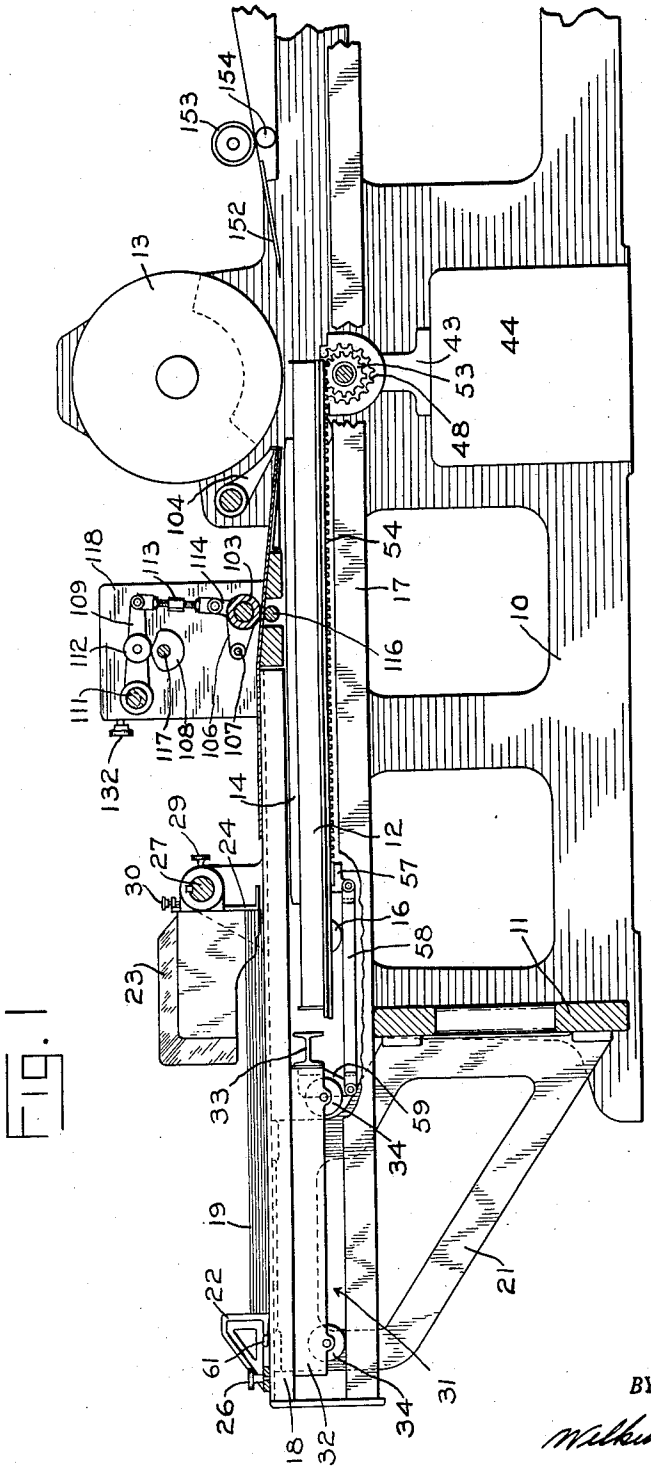


FIG. 1

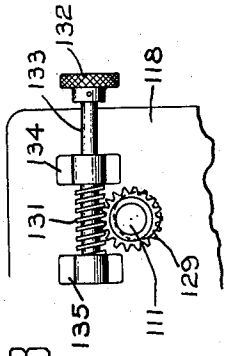


FIG. 8

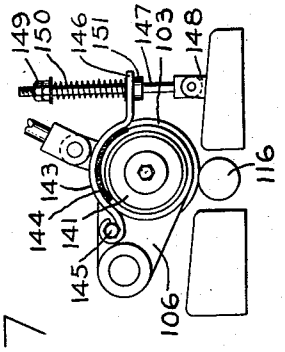


FIG. 7

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FEEDER FOR CARTON AND THE LIKE MATERIAL

Filed Aug. 14, 1956 3 Sheets-Sheet 2

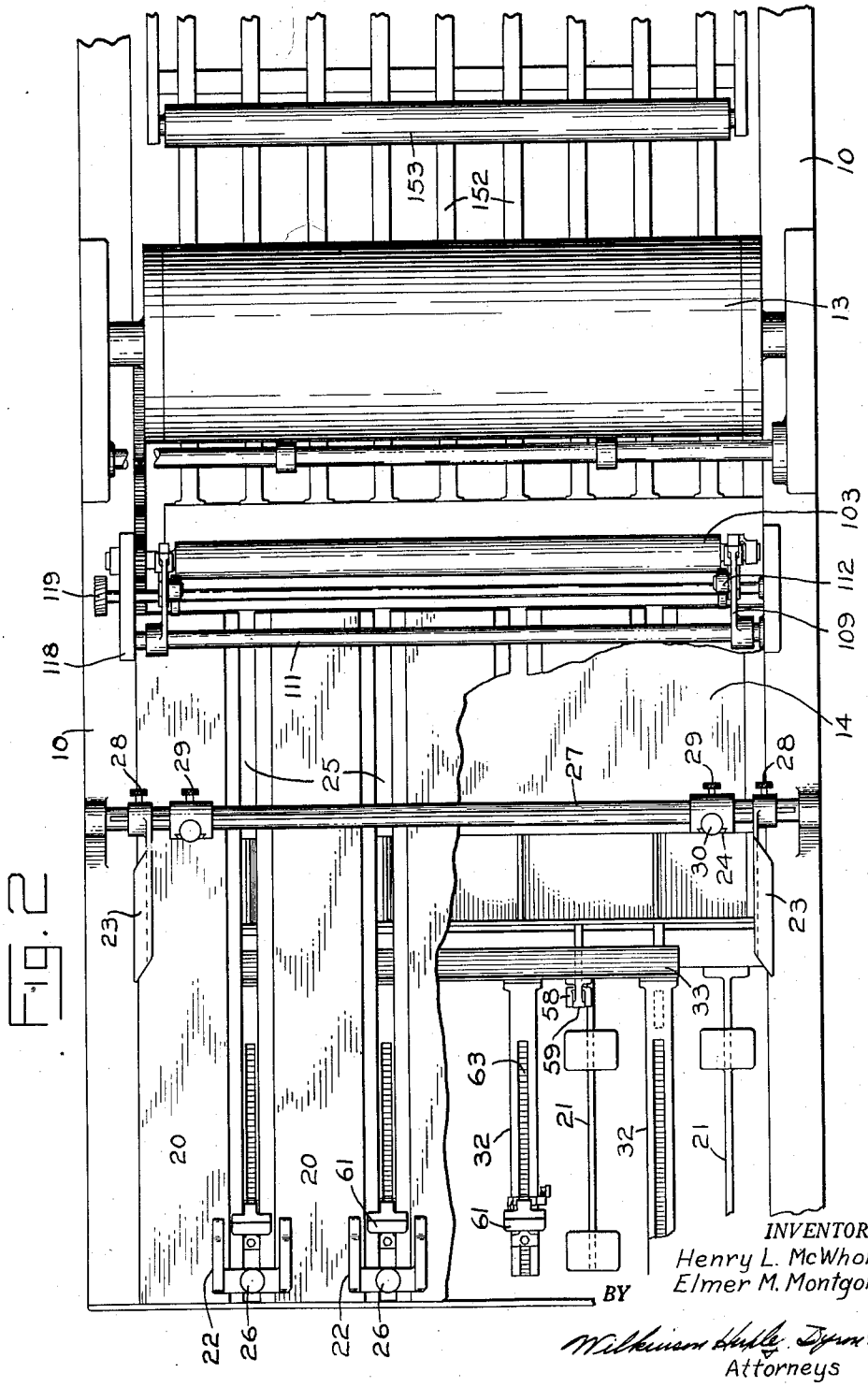



Fig. 2

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FEEDER FOR CARTON AND THE LIKE MATERIAL

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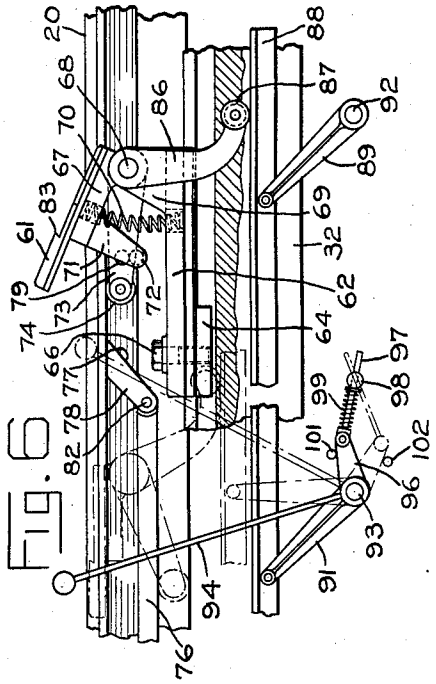


FIG. 6

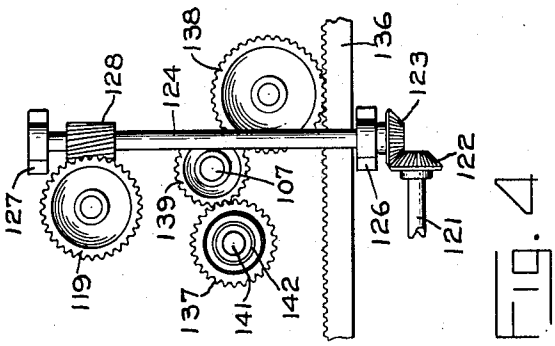


FIG. 4

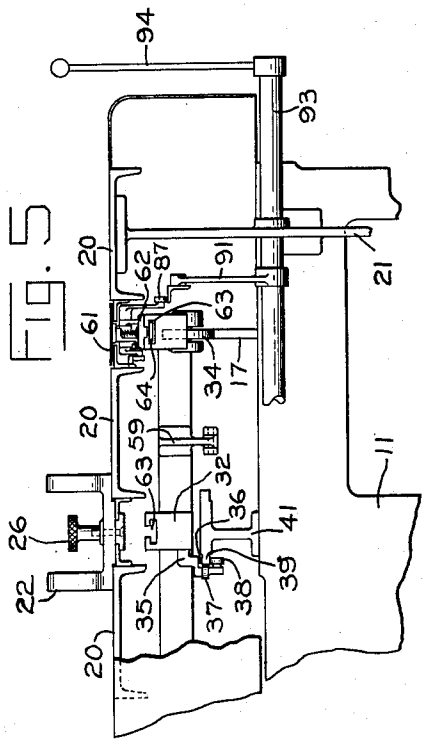


FIG. 5

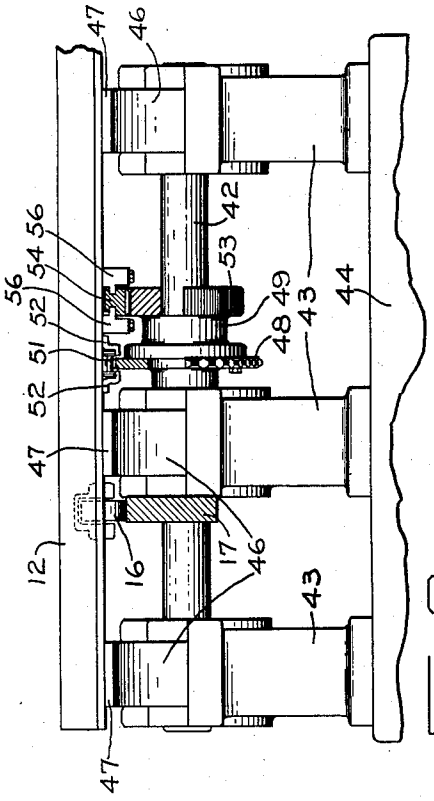


FIG. 3

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United States Patent Office 2,906,529 Patented Sept. 29, 1959



2,906,529

# FEEDER FOR CARTON AND THE LIKE MATERIAL

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Application August 14, 1956, Serial No. 603,974

11 Claims. (Cl. 271—44)

This invention pertains to that class of presses commonly known as flat bed and cylinder presses and particularly those used for die cutting cardboard or the like flat sheet material. It is directed more specifically to a novel feeder for such presses which is particularly adapted for the feeding of stiff corrugated board and the like sheet material.

For many years flat bed and cylinder presses have been used for die cutting and creasing work, particularly on light weight cardboard and the like stock, which can be fed, either by hand or by conventional top sheet feeders, to grippers on the impression cylinder. These sheets are then carried around the cylinder to be cut and creased by the die mounted on the reciprocating flat bed, whereupon they are delivered to a pile at the front of the press.

This practice is still followed and is entirely satisfactory when the cardboard sheets are relatively thin and flexible, enabling them to be wrapped around the impression cylinder as they travel through the press. Difficulty arises, however, when sheets of stiff, heavy cardboard, and particularly corrugated board, are to be processed. Such material can not be wrapped around the impression cylinder without cracking or breaking apart and, therefore, a vast percentage of this work has been performed heretofore, on relatively low production, platen type presses.

In order to take advantage of the higher speed of flat bed and cylinder presses, it is essential that the mechanism for the feeding and handling of sheets be modified so that stiff cardboard sheets can be fed directly into the bite between the form and the impression cylinder without having to be wrapped around the impression cylinder. Moreover, because cardboard and/or corrugated sheets are relatively thick, a stack of such sheets is depleted in a short time. Therefore, it is preferred that the feeder be arranged to feed sheets from the bottom of the pile so that the supply thereof can be constantly replenished without requiring the press to be shut down each time for reloading.

Bottom sheet feeders of this general class have been used in the past but, with the exception of specialty machines, have met with limited success for various reasons such as the complicated and expensive feeder drive mechanisms employed and the inability of such feeders to consistently feed sheets in accurate register and in timed relation to the press.

It is a primary object of this invention, therefore, to provide an efficient, economical feeder for flat sheets having a simplified drive mechanism which is actuated directly by movement of the bed of the press and in precise timed relation therewith.

Another object is to provide a feeder which will advance the bottom sheet of a pile of sheets, at reduced speed with relation to the reciprocating bed, until it is completely removed from the pile, whereupon it is advanced at the same speed as the bed into the bite between the bed and the impression cylinder.



A still further object resides in the provision of means for accurately registering each sheet after it is removed from the pile and before it is advanced into the bite of the cylinder and bed.

A further object is to provide a feeder which will advance two sheets simultaneously, one sheet being advanced at the same speed as the bed into the bite between the bed and the cylinder, while the other sheet is advanced at a reduced speed with relation to the bed from beneath the pile to the registering position.

Other objects and advantages will become apparent from the following description and the accompanying drawings wherein:

Figure 1 is a side elevation of a flat bed and cylinder press incorporating the present invention;

Figure 2 is a plan view of the machine depicted in Figure 1;

Figure 3 is a view partly in section showing the mechanism for driving the feeder carriage;

Figure 4 is a view illustrating the drive mechanism for the sheet forwarding roller;

Figure 5 is an end view of Figure 1;

Figure 6 is a side view of the sheet pusher elements and the associated mechanism for controlling same;

Figure 7 is a view showing the mechanism for braking the sheet forwarding roller during the inoperative portion of its cycle; and

Figure 8 is a fragmentary view illustrating the mechanism for adjusting the position of the feed roller.

In the following description and accompanying drawings the invention is described and illustrated as embodied in a flat bed and cylinder cutting and creasing press for die cutting sheets of cardboard, corrugated board, and the like sheet material into folding box blanks and the like. While the machine is particularly advantageous for such use, it will be understood that it can be utilized for feeding virtually any type of stiff sheet material such as fibre board, plywood, metal etc., to various types of sheet processing machines and, therefore, the use of the invention is not limited to any specific purpose.

Referring now more specifically to the drawings, Figure 1 illustrates a conventional cutting and creasing press comprising side frame members **10** and end frame members **11** which provide support for the reciprocable bed **12**, and the impression cylinder **13** which coacts with the bed, or rather with the cutting die **14** carried on the bed, to die cut and crease blank sheets of cardboard or the like which are fed into the bite between the bed and cylinder. The bed is preferably provided with rollers **16**, one being located adjacent each corner of the bed. Preferably, said rollers are supported by and ride over a pair of spaced, parallel tracks **17** as the bed reciprocates.

For convenience and to avoid confusion, the conventional mechanism for driving the bed and cylinder in unison through their cycle of operation has not been shown because it forms no part of the present invention and, therefore, need not be described.

It should be understood, however, that the bed is positively driven in a continuous reciprocating cycle and that the cylinder is driven in one direction only through two complete revolutions for each complete cycle of operation. On the forward stroke of the bed, the cylinder coacts therewith to perform the die cutting operation, whereas on the return stroke of the bed the cylinder is tripped to an inoperative position, spaced from said bed and continues to rotate in the same direction, all as is well known in the art.

To the rear of the impression cylinder **13** is a feed table **18** which provides support for a stack **19** of blank sheets to be die cut and creased. The feed table is com-

prised of a series of horizontally disposed plates 20, see Figure 2, which are arranged in spaced parallel relation so as to extend over the path of the bed 12 and project rearwardly beyond the main frame of the press, the projecting portions thereof being supported by a corresponding number of reinforcing brackets 21.

The stack of sheets 19, is maintained in position and in vertical alignment on the feed table 18 in a hopper or magazine which is defined by a series of back stops 22, a pair of side plates 23, and a pair of front guides or gate members 24, all of which are adjustable so as to accommodate sheets of varying width and length. As shown in Figure 5, the stops 22 are mounted for longitudinal adjustment in the slots 25 between the plates 20 and may be clamped in any desired position by means of thumb screws 26. The side plates 23 and front guides 24, Figure 1, are in turn adjustable axially on a transverse supporting shaft 27 and are provided with thumb screws 28, 29, respectively, for securing these members in position. The front guides 24 are also adjustable vertically by means of thumb screws 30 in accordance with the thickness of the sheets so as to prevent more than one sheet from being forwarded at any given time.

Mounted below the feed table 18 is a reciprocable feeder carriage 31 which is adapted to be reciprocated in timed relation to the movement of the bed 12 for the purpose of advancing the bottom sheet of the stack 19 toward the impression cylinder 13 during each forward stroke of the bed.

The carriage 31 consists of a series of four parallel beams 32 which are connected at their front ends to a transverse cross member 33 to form an integral unit. The beams 32 are arranged in spaced relation along the cross member 33 so that one such beam is disposed directly beneath a corresponding slot 25 of the feed table 18.

Said carriage is supported for reciprocating motion in the same plane as the bed 12 on the tracks 17 by means of rollers 34, one such roller being provided adjacent each end of the two outer beams 32. The two inner beams in turn are equipped with brackets 35 at each end thereof which carry three guide rollers 36, 37, 38, Figure 5. These rollers are arranged to engage the top, side and bottom respectively of a guide rail 39 formed on one edge of a supporting member 41 to support the center beams 32 and prevent any lateral motion of the feeder carriage 31.

Although only one such guide roller assembly is illustrated in Figure 5, it will be understood that the other inner beam 32 is similarly equipped with rollers arranged in opposed relation to those illustrated so as to provide the necessary control. In addition, the rollers 36, 37, 38 preferably are journalled on adjustable eccentric shafts to provide adjustment whereby the rollers are positioned relative to the rail 39 to eliminate excessive play.

Power to drive the feeder carriage 31 through its reciprocating cycle in timed relation to the bed 12 is derived from the shaft 42 of a counter roller assembly which is an essential part of the press proper and which provides reinforcement for the bed 12 as it moves under the impression cylinder on the impression stroke. One half of the complete counter roller assembly is illustrated in Figure 3, it being understood that an identical unit is provided on each side of the longitudinal center line of the press, and that these units are separated at the center to provide clearance for the bed drive mechanism. As shown in Figure 3, the roller shaft 42 is journalled for rotation below the bed 12 in trunnions 43, which are secured to a base member 44. Said shaft carries three counter rollers 46 which are keyed or otherwise secured to the shaft and are adapted to roll against rails 47 provided on the under side of the bed 12, to thereby reinforce the bed against the force of impression as a sheet passes between the bed 12 and the cylinder 13 on the die cutting stroke. In order to prevent slippage between the rollers 46 and the rails 47 when the bed decelerates and reverses its direction at the end of each stroke, the shaft 42 is positively driven by means of a sprocket 48 which is bolted to a housing 49, keyed to the shaft 42. A chain 51, fixed to the bottom of the bed 12, in brackets 52, meshes with and drives the sprocket 48 as the bed 12 reciprocates. It will be appreciated that the pitch circle diameter of the sprocket is the same as the diameter of the rollers 46 so that said rollers will travel at the same surface speed as the bed.

The housing 49 has formed integral therewith a spur gear 53, which has a pitch diameter less than that of the sprocket 48, and which is adapted to mesh with a toothed rack 54. The latter is substantially I shape in cross section and is mounted for reciprocating motion relative to the bed in a pair of guide rails 56 which are secured to the under side of the bed.

It will be apparent from the foregoing description that, as the bed 12 reciprocates, a relative reciprocating motion will be imparted to the rack 54 through the sprocket 48 and its associated spur gear 53. Moreover, the rack 54 will be moved in the same direction as the bed 12, but due to the smaller diameter of gear 53, such motion will be at a reduced speed with respect to the bed and through a shorter distance.

At its rear end, the toothed rack 54 is provided with a bracket 57, see Figure 1, to which is connected one end of a connecting link 58. The other end of the link 58 in turn is connected to the depending end of a bracket 59 which is attached to the rear face of the cross member 33 of carriage 31. Thus it will be seen that as the bed 12 reciprocates, the feeder carriage 31 is driven in precise timed relation therewith at reduced speed and through a shorter distance than said bed.

As shown best in Figures 5 and 6, each beam 32 of the feeder carriage is provided with a pusher blade 61 which is adapted to engage the bottom sheet of the stack 19 each time the carriage moves forward to advance said sheet toward the impression cylinder 13. These pusher blades are pivotally mounted on a base member 62 in a manner that they project through the respective slots 25 in the feed table 18 and are controlled so as to engage only the bottom-most sheet thereon.

It will be noted that the extent of travel of the feeder carriage on its forward and reverse strokes is fixed and, therefore, in order to feed sheets of different lengths, the base members 62 and therewith the pusher blades 61 are made adjustable lengthwise on the beams 32. For this purpose said beams are provided with T slots 63 along the top face thereof in which the base members 62 are mounted. A clamp bar 64, inserted in the slot 63, is connected to the base member 62 by means of a bolt 66, which, when tightened, clamps the base member in any desired position lengthwise of the slot 63.

The sheet pusher blade 61 is mounted on the base member 62 by means of a bracket 67 which is pivotally mounted on a shaft 68 rotatably journalled in a pair of spaced upwardly projecting arms 69 formed at the front end of the base member 62. A compression spring 70, confined between the base member 62 and bracket 67 exerts a constant pressure on said bracket tending to maintain the blade 61 in its sheet engaging position. The bracket 67 also has formed integral therewith a depending arm 71 in which is secured the laterally projecting pin 72 which, as will become apparent hereinafter, is instrumental in controlling the position of the blade 61.

A lever arm 73 secured to one end of the shaft 68 carries at its free end a roller 74 which is adapted to engage the cam 76 to thereby control the position of the pusher blade 61. On the forward stroke of the feeder carriage, the roller 74 rides on the top edge of the cam 76 allowing the pusher blade 61 to assume the position illustrated in full lines, to the right in Figure 6, due to the influence of spring 70, and thereby assuring its engagement with the rear edge of the bottom sheet in the stack.

On the return stroke of the bed, the roller **74** engages the downwardly inclined edge **77** of a switch cam **78** which forces the roller **74** and therewith the arm **73** downwardly and causing the said roller to ride on the lower face of cam **76**. As the lever **73** moves downwardly, a laterally projecting pin **79** carried thereby, engages the pin **72** on the arm **71** of the bracket **67**, causing said arm and therewith the pusher blade **61** to move downwardly against the pressure of the spring **70** until the pusher blade is below the surface of the feed table **18**. This position is indicated by broken lines to the left in Figure 6.

It will be understood that the switch cam is pivotally mounted forward of the front edge of the stack of sheets on the feed table so that the pusher blade **61** will be retracted prior to reaching the stack on the return stroke of the carriage **31**. It also will be appreciated that the switch cam **78** is pivotally mounted on a pin **82** fixed on the depending edge of the feed table plate **20** and that resilient means, such as a torsion spring or the like are provided to maintain the cam in the position as shown in Figure 6. Consequently, on the forward stroke of the feeder carriage the roller **74** will push the switch cam **78** clockwise about its pivot axis **82** against the pressure of the resilient means until it passes the cam. Thereupon, the cam immediately returns to its intercepting position so as to force the roller **74** downwardly to the bottom face of cam **76** on its return stroke.

Cam **76** is of sufficient length so as to maintain the pusher blade **61** in its retracted position on the return stroke until it has returned a distance substantially equivalent to the length of a minimum size sheet and which is approximately half the length of the feed table **18**. At such point, the roller **74** will run off the end of cam **76** and the spring **70** will urge the pusher blade **61** into its raised or feeding position.

In the event maximum size sheets are being processed, the pusher blade **61** will be released while it is still under the stack. However, the weight of the stack will keep the pusher blade depressed until it moves out from under the rear edge of the stack at which point it will immediately rise to its sheet engaging position.

It will be noted that the pusher blade **61** is mounted in such manner as to be, in effect, free floating on the forward or feed stroke. In other words, as shown in Figure 6, the blade **61** is urged upwardly by the spring **70** to a position which is substantially above the bottom sheet of the stack and its maximum raised position is determined by the position of the pin **79** on the lever **73**. However, as the pusher blade **61** moves under the stack of sheets on the feed stroke, the weight of the stack depresses the blade **61** against the force of the spring **70** so that the sheet engaging edge **83** thereof will engage only the bottom sheet. In so doing, the pin **72** moves away from pin **79** thereby allowing the blade **61** to float in an intermediate position which is determined by the weight of the stack and the pressure of spring **70**. Thus it will be seen that during the forward stroke of the carriage **31** the spring **70** will be free to exert a constant pressure against the pusher blade **61** forcing it upwardly and assuring positive engagement of the edge **83** with the rear edge of the bottom sheet of the stack through the entire length of the feed stroke.

In many instances, such as for example, when the press is being made ready for a new job or when other adjustments are required, it is desirable that the press be operated without feeding sheets. In order to provide for such operation the shaft **68** of the pusher blade assembly has secured thereto a second lever **86** which, when rocked in counterclockwise direction, as viewed in Figure 6, will force lever **73** and therewith blade **61** downwardly against the spring **70** to an inoperative position. At its free end this lever carries a roller **87** which is adapted to engage a cam track **88** which is mounted



parallel to the path of roller **87** on a pair of parallel arms **89** and **91**. These arms are supported on a pair of transverse shafts **92** and **93** respectively, which are rotatably mounted below the feed table **18** in the brackets **22**, and a manual control lever **94** is secured to the end of the shaft **93** for moving said arms and therewith the cam tracks **88** between operative and inoperative positions.

When the lever **94** is moved to the left, as seen in Figure 6, the arms **89**, **91** and the cam track **88** are in their lowered or inoperative position wherein the cam track **88** is removed from the path of the roller **87**, as indicated by the solid lines in Figure 6. Moving the lever **94** to the right, however, causes the arms **89** and **91** to rotate to a raised or perpendicular position wherein the cam track **88** is raised into the path of roller **87** thereby causing lever **86** to be rocked counterclockwise. This action moves lever **73** and therewith bracket **67** counterclockwise against the pressure of spring **70** until the pusher blade **61** is retracted to its inoperative position below the surface of the feed table **18**, all as indicated by the broken lines to the left in Figure 6.

The lever **94** is maintained in either of its two positions by toggle means comprising a lever **96** which is secured to the shaft **93** and which has connected thereto one end of a rod **97**. The free end of rod **97** is slidably mounted in a pivoted block **98**, and a spring **99**, confined between the head of the rod **97** and the block **98**, exerts pressure upon the arm **96** in either direction as it passes the dead center line between the block **98** and shaft **93** to maintain said arm against either one of the stops **101** or **102**.

As each sheet is forwarded by the pusher blades **61** during the forward stroke of the bed **12** it advances beneath a feed roller **103** to a position wherein its front edge is adjacent a pair of front guides **104**. At this point, the bed **12** reverses its direction of travel and during the return stroke thereof, the front guides are actuated so as to register the sheet and position it relative to the form **14**.

During this portion of the cycle the feed roller **103** is raised to an inoperative position so as to permit free movement of the sheet when it is first advanced by the pusher blades **61** and to preclude interference therewith during the registering operation.

Immediately thereafter the feed roller drops down to engage the sheet and advance it into the bite between the bed and cylinder as the bed once again moves on its forward stroke.

As shown in Figures 1 and 2, the feed roller **103** is journalled for rotation above the feed table in brackets **106** pivotally mounted on shafts **107** and which are arranged to be oscillated between raised and lowered positions by means of a cam **108** acting through a lever **109**. The latter is rotatable on shaft **111** and carries a cam roller **112** which coacts with the cam **108**. Movement of the lever **109**, due to rotation of the cam **108**, is transmitted to the brackets **106** through turnbuckles **113** which are connected to arms **114** on the brackets **106** and are adjustable in order to position the roller **103** parallel to the coacting idler roller **116** so as to equalize the pressure between the respective rollers throughout their entire length.

The cam **108** is mounted on a shaft **117**, one end of which extends beyond the supporting frame member **118** and carries a worm wheel **119** for driving the shaft in timed relation to the movement of the bed **12**.

As shown in Figure 4, the cam **108** is driven through one revolution for each complete cycle of operation of the press from a drive shaft **121** which is driven from the main drive mechanism of the press. A bevel gear **122** secured to the end of the drive shaft **121**, meshes with a companion bevel gear **123** on the end of a vertical shaft **124**, journalled in bearing blocks **126** and **127**, and which carries a worm gear **128** in driving relation with the worm wheel **119**.

Thus the cam **108** is rotated through one revolution for each cycle of operation to thereby raise and lower the feed roller **103** in timed relation to the movement of the bed **12**, said roller being raised to an inoperative position to provide clearance for the sheet when it is first advanced by the feeder carriage **31** whereupon it is lowered to its operative position in engagement with the sheet, to advance it into the bite between the bed and the impression cylinder as the bed moves on its next succeeding forward stroke.

The feed roller is also adjustable vertically relative to the idler roller **116** in accordance with the thickness of the sheets being processed whereby the pressure of said roller on the sheets will be sufficient to feed the sheets forward when the feed roller is actuated, but will not be so great as to crush the sheets as might readily happen when corrugated board, for example, is being handled.

This adjustment is accomplished through the supporting shaft **111** on which the roller supporting levers **109** are pivotally mounted. At each end, the shaft **111** is provided with eccentric journals, one of which projects through the frame member and carries a worm wheel **129** see Figure 8. A a horizontally disposed worm **131** meshes with the worm wheel **129** and is adjustable by means of a handwheel **132** fixed to the end of the worm shaft **133**. The worm is fixed to said shaft **133** between journal blocks **134** and **135** which prevent axial movement thereof when adjustments are made.

Thus it will be seen that when the worm **131** is turned, the shaft **111** will be oscillated about the axis of its eccentric journals. This motion in turn raises and/or lowers the pivot axis of the levers **109** causing them to fulcrum about the cam rollers **112** which in turn effects a raising or lowering of the feed roller depending upon the direction in which the worm **131** is turned.

In actual practice the feed roller is adjusted to provide a .020" squeeze on the sheets which has proven to afford the friction required to feed the sheets without in any way damaging them. Moreover, after adjustments are made, the worm **131** acts as a locking means which prevents any unintended movement of the worm wheel **129**.

In order that the feed roller **103** will be rotated at the same surface speed as the bed and in precise timed relation therewith, when the bed moves on its forward stroke so as to feed the registered sheet forward in unison with the bed, it is arranged to be driven by the bed through a toothed rack **136** mounted along one edge thereof and which drives the feed roller drive gear **137** through the intermediate idler gears **138** and **139**. These gears remain in constant mesh with the rack **136** and, therefore, their direction of rotation is reversed each time the bed reverses its direction of travel. Gear **137**, however, is not connected directly to the shaft **141** of the feed roller **103** but drives said shaft through a one way clutch **142** which engages and drives the roller shaft **141** on the forward stroke of the bed, but automatically disengages said shaft when the gear **137** reverses its direction of rotation. Moreover, the idler gear **139** is mounted for rotation about the shaft **107**, which also is the pivot axis of the feed roller supporting brackets **106**, so that gear **137** merely rolls about the periphery of the gear **139** when the feed roller is raised and lowered, without affecting the meshing relation of said gears.

With particular reference to Figure 1 it will be noted that when the sheet is in the register position against the front guides **104**, its leading edge is only a relatively short distance from the line of contact between the impression cylinder **13** and the bed **12**. Consequently, the feed roller **103** is rapidly accelerated to advance the sheet through this distance at the same speed as the bed and as the leading edge of the sheet enters into the bite between the cylinder and bed, the cam **108** raises the feed roller to its inoperative position. However, the clutch **142** remains engaged and the drive gears **138**, **139** and **137** continue to drive the feed roller until the bed begins to decelerate near the end of its forward stroke. At this point the clutch assembly **142** disengages the roller shaft **141** from its drive mechanism and the inertia of the roller tends to keep it rolling at relatively high speed even after the bed **12** has been decelerated, reversed and has completed its return stroke.

In order to stop the rotation of the feed roller **103** before it drops down on the next sheet to be advanced, brake means are provided as shown in Figure 7.

A brake band **143**, having brake lining **144** secured thereon, is pivotally mounted by means of a stud **145** to the bracket **106** which supports the feed roller **103**. The brake band is curved so as to be concentric with the roller shaft **141** and is formed with a projecting end **146** having an opening therein through which a rod **147** is slidably inserted. The latter is pivotally connected at one end to a stationary boss **148** on the edge of the feed table and is provided at its other end with adjustable nuts **149**. A compression spring **150** is confined between the nuts **149** and the end **146** of the brake band **143** tending to maintain said end in contact with a collar **151** on the rod **147**.

Thus when the feed roller **103** is down in its operative position the brake band is held in spaced relation with the roller journal to permit free rotation thereof as the bed **12** begins its forward stroke. As the roller is raised to its inoperative position, however, the periphery of its shaft **141** immediately engages the brake lining **144**, the effect of which increases as the roller rises due to the tension of the spring **150** to thereby rapidly decelerate the roller. This braking effect can be increased or decreased by adjusting the nuts **149** to thereby vary the tension of the spring **150** in order to have the roller **103** come to a complete stop before it drops into engagement with the next sheet to be advanced.

After a sheet passes between the impression cylinder **13** and bed **12** it is stripped off of the form **14** by a series of stripper fingers **152** which guide the sheet up an incline and between delivery feed rollers **153** and **154**. Roller **153** is preferably a friction roller which is positively driven to advance the cut and creased sheets to delivery conveyor mechanism for deposit on a pile or to a stripping machine which strips the scrap pieces from between the box blanks before they reach the delivery pile as is well known in the art.

A brief general description of the operation of the device is as follows:

On each forward or die cutting stroke of the bed **12**, the sprocket **48**, Figure 3, drives the spur gear **53**, which in turn drives the rack **54**, in the same direction as the bed. Because of the reduced diameter of the spur gear **53** with respect to the sprocket **48**, the motion of the rack is at a slower speed than the bed and it moves through a shorter distance.

This motion is transmitted to the feeder carriage **31** through the connecting rod **58** causing the pusher blade **61** to engage and advance the bottom sheet of the stack **19** until it is completely removed from the stack and its leading edge is adjacent the front guides **104**. At this point the bed **12** reaches the end of its forward stroke and reverses its direction for the return stroke. During the return stroke of the bed a slight rearward motion is imparted to the front guides to thereby register the sheet and position it with relation to the cutting die **14**.

As the bed nears the end of its return stroke, the feed roller **103**, which has been held in its raised position by the high portion of cam **108**, is lowered onto the sheet as the low portion of cam **108** moves under roller **112**, to thereby hold the sheet in its registered position as the front guides are raised out of the path of the sheet.

Moreover, during the rearward movement of the feeder carriage **31**, the roller **74** of the pusher plate assembly, Figure 6, is depressed by the switch cam **78** to the lower edge of cam tracks **76** thereby retracting the pusher

blades 61 below the stack 19 until the roller 74 runs off the end of cam 76 at which point spring 70 urges the pusher blade 61 above the plane of the feed table to engage the next bottom sheet.

As the bed 12 starts on its next forward stroke, the feed roller 103 is rotated at the same surface speed as the bed by the gear train comprising the rack 136, gears 138, 139, 137 and the one way clutch 142, to advance the registered sheet at the same speed as the bed into the bite between said bed and the impression cylinder as the feeder carriage 31 advances the next bottom sheet of the stack 19, at reduced speed with respect to the bed 12, into the registering position. It will be appreciated that before the next subsequent sheet reaches the registering position, the preceding sheet will have been removed therefrom, the feed roller 103 will have been raised to its inoperative position and the front guides 104 will have returned to their register position as indicated in Figure 1.

From the foregoing description it will be apparent that the present invention provides a simple, efficient, and economical feeding device for feeding stiff sheets of material such as cardboard, corrugated board, fibre board, plywood or even metal sheets to a cutting and creasing, printing or like machine.

It also will be evident that various changes may be resorted to in the construction, form and arrangement of the several parts without departing from the spirit and scope of the invention and, therefore, we do not intend to be limited to the particular embodiment herein shown and described.

We claim:

1. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, feed means for advancing the bottom sheet of the stack toward the bite of said member and bed, and drive means actuated by movement of said bed for imparting relative reciprocating motion to said feed means in timed relation to said bed.

2. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted for reciprocation below said support for advancing the bottom sheet of said stack toward the bite of said member and bed, and drive means actuated by movement of said bed for imparting relative reciprocating motion to said carriage in timed relation to said bed.

3. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed through the bite between said bed and member, the combination comprising a support for a stack of sheets, means actuated by movement of said bed for initially advancing the bottom sheet to a registering position at the forward end of said support wherein it is free of said stack, means for registering the sheet while it is in said position, and means also actuated by movement of said bed for thereafter advancing the registered sheet into the bite of said bed and said member.

4. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed through the bite between said bed and member, the combination comprising, a support for a stack of sheets, means actuated by movement of said bed for initially advancing the bottom sheet at reduced speed with respect to said bed to a registering position at the forward end of said support wherein it is free of said stack, means for registering the sheet while it is in said position, and means also actuated by movement of said bed during its forward stroke for thereafter advancing the registered sheet at the same speed as said bed into the bite of said bed and said member.

5. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted for reciprocation below said support for advancing the bottom sheet of said stack toward the bite of said member and bed, a member slidably mounted on said bed, means connecting said member with said carriage, and means actuated by the movement of said bed for imparting relative reciprocating motion to said member and thereby to said carriage in timed relation to said bed.

6. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted for reciprocation below said support, drive means actuated by movement of said bed for imparting relative reciprocating motion to said carriage in timed relation to said bed, elements mounted on said carriage for engaging and advancing the bottom sheet of said stack for each forward stroke of said carriage, and means for raising and lowering said elements into and out of the plane of the bottom sheet at the end of each rearward and forward stroke respectively, of said carriage.

7. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted for reciprocation below said support, drive means actuated by movement of said bed for imparting relative reciprocating motion to said carriage in timed relation to said bed, elements mounted on said carriage for engaging and advancing the bottom sheet of said stack for each forward stroke of said carriage, means for raising and lowering said elements into and out of the plane of the bottom sheet at the end of each rearward and forward stroke respectively, of said carriage, and manually operable means for maintaining said elements in their lowered position.

8. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted below said support, drive means actuated by movement of said bed for imparting relative reciprocating motion to said carriage in timed relation to said bed, pusher means on said carriage for advancing the bottom sheet from beneath said stack to a registering position at the forward end of said support for each forward movement of said carriage, means for registering the sheet while it is in said position, and means for thereafter feeding the registered sheet into the bite of said member and bed.

9. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for a stack of sheets, a carriage mounted below said support, drive means actuated by movement of said bed for imparting relative reciprocating motion to said carriage, means on said carriage for advancing the bottom sheet from beneath said stack to a registering position at the forward end of said support for each forward stroke of said carriage, registering means for registering the sheet while it is in said position and while the carriage completes its rearward stroke, and additional means for thereafter feeding the registered sheet into the bite of said member and bed as the carriage moves forward to advance the next succeeding bottom sheet.

10. In a machine of the class having a reciprocating

flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising a feed table for supporting a stack of sheets adjacent the rear edge thereof, registering means located adjacent the front edge of said table for registering the lay of the sheets before they enter the bite between said member and said bed, and dual sheet forwarding means both actuated by movement of said bed for simultaneously advancing two sheets, one sheet being propelled at the same speed as said bed toward the bite of said member and said bed as the other sheet is advanced, at reduced speed, to the registering means.

11. In a machine of the class having a reciprocating flat bed coacting with a rotary impression member for processing sheets fed into the bite between said member and said bed, the combination comprising, a support for



a stack of sheets, first feed means for advancing each successive bottom sheet of said stack to a register position on said support, second feed means for advancing the sheets from the register position into the bite of said member and said bed, both said feed means being actuated by motion of said bed whereby during each forward stroke of said bed two sheets are advanced simultaneously, one sheet at the same speed as said bed into the bite of said member and bed and the other sheet, at reduced speed with respect to said bed, into the registering position.

**References Cited** in the file of this patent

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UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 2,906,529 September 29, 1959

Henry L. McWhorter et al

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 12, line 17, list of references cited, for the patent number "1,396,631" read -- 1,396,531 --.

Signed and sealed this 22nd day of March 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents