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FEED MECHANISM IN PAPER BOX MACHINES

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Fig. 1

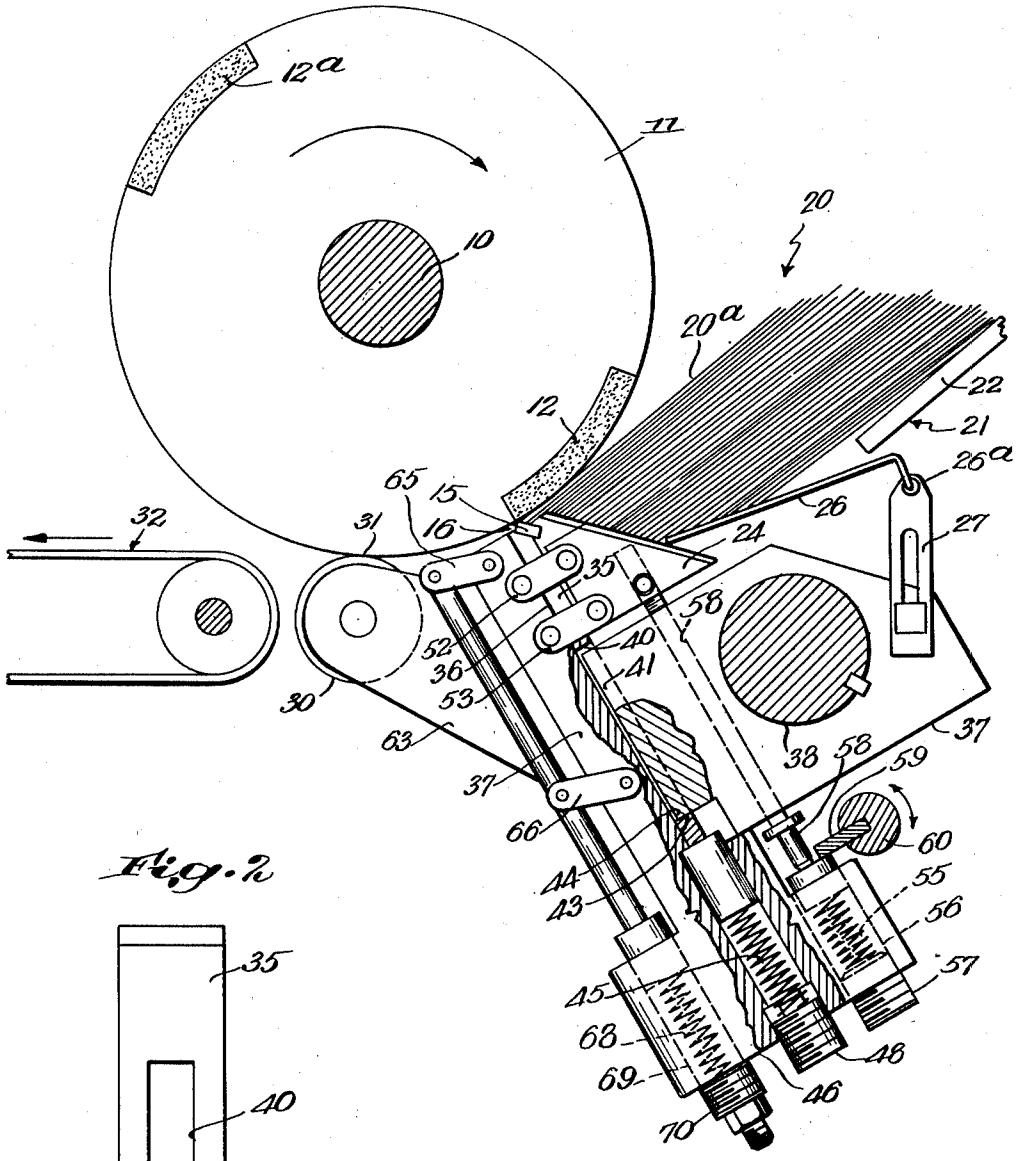


Fig. 2

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FEED MECHANISM IN PAPER BOX MACHINES

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6 Claims. (Cl. 271—36)

This invention relates to machinery for processing flat paper box blanks in sheet form, for instance box forming machines.

In paper box processing machinery the flat blanks are brought to the machine in a stack which is placed and replenished in hopper mechanism from which they are fed to the machine one by one for processing in a continuous sequential series of operations of the "belt line type," for instance die stamping, gluing, folding and forming. This invention concerns the feed mechanism by which the box blanks are separated from the stack and fed into the machine. The box blanks are usually separated from the stack by a friction feed member which engages the uppermost or, in some cases, the lowermost blank (this being known as top and bottom feed, respectively), and pulls the blank from the stack while a stationary retard member holds back the rest of the blanks in the stack, particularly the second blank, so that single blanks are fed to the machine in rapid succession. The frictional feed device in this type of feed usually includes a rotating feed wheel having a rubber friction element in its periphery for wiping or dragging successive blanks from the stack and moving them toward the machine, and such feed mechanisms are either timed or untimed, depending on whether one blank follows directly and indiscriminately behind the other, in which case the frictional member is continuous around the entire periphery of the feed wheel or whether the blanks are fed out in a specific spaced relationship to each other and in time with the rotation of the feed wheel in which case the frictional member comprises only one or more spaced segmental portions of the periphery of the feed wheel, the remaining peripheral surface being smooth and of low frictional characteristics. The retard member referred to is conveniently herein identified as a feed gate and it is positioned with respect to the surface of the feed wheel so as to form a throat through which the blanks are fed one by one. The feed gate of the present invention is particularly useful in timed feed mechanism in connection with which it is described herein although its use is not confined to this type of feed alone.

The conventional retard member or feed gate consists usually of a block of hard rubber mounted close to the feed wheel so as to form the gap or throat through which the blanks are passed. The position of such a feed gate is fixed and the gap between the gate and the feed wheel forming the throat is adjusted so as to allow the passage through the throat of only one blank at a time. The friction characteristics of such a feed gate are less than those of the friction drive element in the feed wheel so that operation of the two elements depends on the difference in friction properties between the two, the greater adhesiveness of the feed element serving to drag the end blank in the stack through the throat while the lesser adhesiveness of the retard member serves to help retain the next blank against the frictional drag exerted between the two blanks. In such a machine the adjustment of the rubber retard member with respect to the feed wheel is very critical because of the balance of friction between the two friction elements involved. If the retard is too close to the feed wheel, there will be no feeding at all since the blank will not pass through the throat, and if it is too far away from the feed wheel, more than one blank will be fed at a time. The gap between the feed wheel and the retard rubber member is difficult to maintain, since the rubber or like substance of the retard member wears down as feeding progresses and frequent readjustment is necessary.

My invention relates to improved feed gate mechanism including a yieldably movable feed gate in combination with feed means such as a feed wheel, the principal object of my invention being to provide improved feed mechanism for flat paper box blanks. The invention is described and illustrated in a preferred embodiment of timed top feed mechanism which includes a number of novel features which together with the improved feed gate accomplish the stated and other objects as described and illustrated in the drawings in which:

Fig. 1 is a side view of the mechanism of the invention taken on sections normal to the axis of the feed wheel and partly broken away for purposes of clarity;

Fig. 2 is a view taken along the lines 2—2 of Fig. 1 indicating the shape of the movable part which supports the feed gate of the invention.

In the drawings are illustrated a feed wheel **11** of usual type comprising a rotatable metal drum having a smooth surface and mounted on a shaft **10** which is driven by means not shown. Mounted in the peripheral surface of the feed wheel are a pair of frictional feed elements **12** and **12***a* made of a substance such as rubber and having adhesive properties when they encounter the surface of a box blank. Mounted adjacent the periphery of the feed wheel is a feed gate **15**, preferably metal or other hard substance of rectangular shape extending along a peripheral element of the feed wheel **11**. A stack of box blanks indicated at **20** are contained in hopper mechanism indicated at **21** which may comprise a feed board **22** of the conventional type, a movable presser shoe **24**, and a presser shoe follower **26** lying between the feed board **22** and the presser shoe **24** and all to be further described. The stack of blanks **20** are moved along and supported by the elements **22**, **24** and **26**, so that the top blank **20***a* first approaches the throat **16**, most of the blanks immediately under and behind it being retained away from the throat by the presser shoe **24** and only one or two blanks behind the top or end blank **20***a* thus being allowed to move against the feed gate **15**. A follow up roll **30** is mounted to be urged yieldably against the surface of the feed wheel **11** for the purpose of carrying away blanks passing through the throat **16** through the bite **31** and to conveyor mechanism such as a lug type belt indicated at **32** of the usual type and which is generally arranged so as to convey the blanks away from the feed wheel in the spaced relation in which they are fed by the feed wheel to the conveyor mechanism.

The feed gate **15** is mounted on a plate **35** which is slidable toward and away from the surface of the feed wheel **11** in a slot **36** which is formed in a feed block **37** which is, in turn, keyed to a bar **38** adjustably attached to the frame of the machine. The support plate **35** has a slot **40** into which a tongue **41** on the block **37** protrudes to guide the plate **35** and to limit its endwise movement particularly toward the feed wheel **11**, the bottom **43** of the slot abutting against the bottom **44** of the tongue **41**, when the gate **15** is in its uppermost position. The feed gate **15** and its supporting plate **35** are urged upwardly toward the feed wheel **11** by a spring **45** secured in a bore **46** in the bottom of the block **37** by a threaded plug **48**, adjustment of which determines the compressive force exerted by the spring **45**. Therefore, the feed gate **15** can be moved downwardly away from the feed wheel against the force of the spring **45** to open the gap **16** between the gate **15** and the wheel **11** by the box blank **20***a* as it is forced through the throat **16** between them by one of the feed elements **12**, **12***a*.

The presser shoe **24** is connected to the block **37** by a pair of parallelogram type links **52** and **53** for reciprocatory movement toward and away from the feed wheel **11**. A spring **55** in the bottom of the block **37** retained in a bore **56** by a threaded plug **57** urges the shoe **24** toward the feed wheel **11** through a stem **58** which is slidable endwise in the block **37**. The presser shoe **24** is caused to reciprocate in time with the rotation of the feed wheel **11** toward and away from the wheel **11** by an arm **59** in an oscillating shaft **60** which is driven by

means not shown, the arm **59** moving the shoe downwardly and the spring **55** moving it upwardly. The presser shoe follower **26** rests on the presser shoe and is pivoted at **26***a* on a bracket **27** adjustably secured to the block **37** and it moves up and down with the presser shoe **24** and cooperates to transfer some of the up and down movement of the shoe back into the stack of blanks **20** and toward the feed board **22**.

The follower up roll **30** is connected by a bracket **63** upon which it is mounted, to the block **37** through a pair of parallelogram links **65** and **66** for movement toward and away from the feed wheel. It is urged against the wheel **11** by a spring **68** in a bore **69** in the bottom of the block **37** and retained therein by a threaded plug **70**. The roll **30** therefore yields away from the feed wheel **11** as the blank is forced through the bite **31** between them and over onto the conveyor mechanism **32**.

In operation, the feed wheel **11** revolves clockwise as shown in the direction of the arrow. The stack of blanks **20** is urged toward the throat **60** by the hopper mechanism **21** and with the top blank **20***a* against the feed gate **15**. As the friction element **12** or **12***a* comes into contact with the top blank, it drags it to the left against the gate **15**, forcing the gate downwardly just enough to allow the passage through the throat **16** of one blank, but at the same time retaining the second and other blanks behind it. The top blank **20***a* continues to the left and across the follower roll **30** and over onto the conveyor belt **32**. The plug **48** against the spring **45** is adjusted so that the gate **15** yields downwardly as the top blank is forced through the throat but so that the spring **45** is strong enough to hold the other blanks back against the friction force between the first and second blank. As the trailing edge of the first blank passes the feed gate, the gate snaps back to its original gap which was adjusted to be slightly less than the thickness of the blank being fed, and holds the second blank back against the slight friction of the smooth surface of the feed wheel between the friction elements **12** and **12***a* and until the next friction element engages the second blank which is now the first blank on top of the stack. The oscillation of the presser shoe **24** by the shaft **60** is timed so that it moves upwardly to force the end of the stack **20** and therefore top blank **20***a* against the feed wheel just as one of the friction inserts engages the top blank, thereby increasing the frictional force on the blank when required at the start of the feeding operation. The presser shoe **24** moves downwardly yieldably relieving pressure and frictional forces between the wheel and the top blank and also between the blanks behind the top or end blank, except when one of the frictional elements is actually engaging a blank in a feeding operation. The presser shoe **24** and its follower plate **26** have the effect of increasing the efficiency and positive operation of the feed wheel **11** and the yielding feed gate **15**. In some cases, particularly where continuous feed rather than timed feed is desired, it may be desirable to remove the presser shoe actuating mechanism **59** and **60** and to allow the presser shoe **24** and its follower plate **26** to yield against the adjusted pressure of the spring **55** so as to control the frictional and pressure forces between the blanks in the end of the stack nearest the feed wheel.

I claim:

1. In a machine for processing paper box blanks and in combination, feed mechanism for feeding flat blanks from an adjacent stack of said blanks into said machine, said mechanism comprising a feed roll and a feed gate forming a throat through which said blanks may be successively moved from said stack, said feed gate being slidable in a straight line toward and away from said feed roll and yieldably urged toward said feed roll, said feed roll having a friction element on its peripheral surface successively engaging blanks on the end of the stack toward said throat and dragging each of said end blanks in succession through said throat while said feed gate retains the other blanks of the stack, said feed gate being actuated by and bodily yielding to the movement through said throat of each said blank and then moving back toward said roll to retain the blanks in said stack until another said end blank is engaged by said friction element.

2. The mechanism as set forth in claim 1, and in combination, said mechanism including means to support the end of the said stack toward said throat, said support means being yieldable and thereby relieving excessive pressure between blanks in the said end of the stack.

3. The mechanism as set forth in claim 1 and in combination, said mechanism including means to support the end of the said stack toward said throat and against the feed roll, said support means being yieldable and thereby relieving excessive pressure between blanks in the said end of the stack against the feed roll, and means intermittently to move said support means downwardly away from said stack and feed roll in time with the operation of said feed roll.

4. In a machine for processing paper box blanks and in combination, feed mechanism for feeding flat blanks from an adjacent stack of said blanks into said machine, said mechanism comprising a feed roll, a slidable feed gate in close proximity forming a throat said feed gate being slidable in a straight line toward and away from said roll, means yieldably to urge said gate close enough to said roll to prevent passage of blanks between them, said roll having a friction element on a portion of its periphery intermittently frictionally engaging successive blanks on the adjacent end of said stack and forcing them through said throat one at a time while said gate yields just far enough to allow them passage said gate being actuated by a blank forced through said throat.

5. In a machine for processing paper box blanks and in combination, feed mechanism for feeding flat blanks from an adjacent stack of said blanks into said machine, said mechanism comprising a feed roll, a slidable feed gate in close proximity forming a throat said feed gate being slidable in a straight line toward and away from said roll, means yieldably urging said gate close enough to said roll to prevent passage of blanks between them, said roll having a friction element on its periphery intermittently engaging one successive blank on the adjacent end of said stack and forcing it through said throat while said gate yields far enough to allow its passage said gate being actuated by a blank forced through said throat, and means to urge said stack toward said throat.

6. In a machine for processing paper box blanks and in combination, feed mechanism for feeding flat blanks from an adjacent stack of said blanks into said machine, said mechanism comprising a feed roll and a feed gate of hard material in close proximity forming a throat, said feed roll having at least one friction element on its peripheral surface, said friction element being frictionally engageable with successive blanks on the nearest end of said stack to drag each blank through said throat, said feed roll and feed gate being yieldably movable apart in a straight line substantially normal to the line of movement of said blanks through said throat and movable apart far enough to allow passage between them of one flat blank at a time from said stack while the remaining blanks of the stack are retained by said gate and being otherwise urged together close enough to prevent movement of the blanks between them, the movement apart of said feed roll and said feed gate being actuated by the movement of a blank between them.

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