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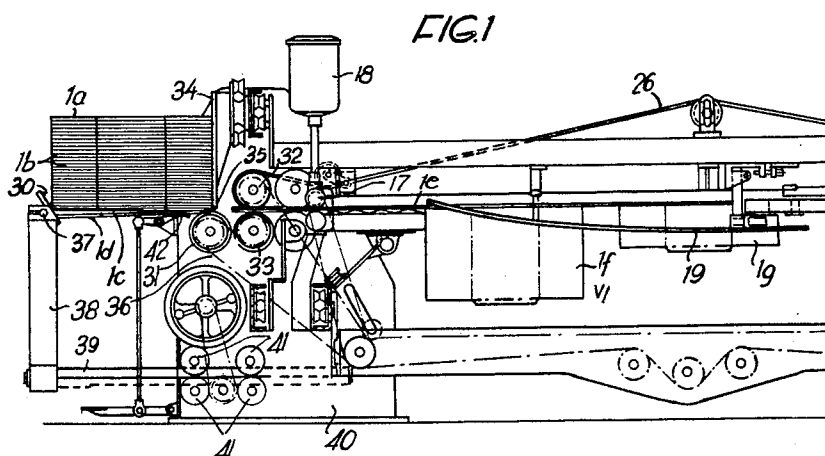
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FEEDING MECHANISM FOR STACKED ARTICLES

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FIG. 7

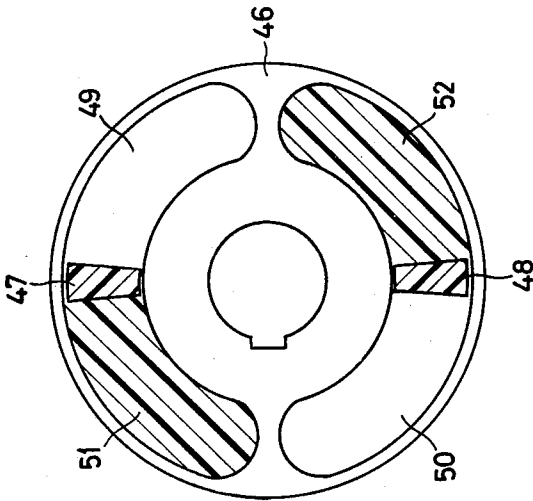
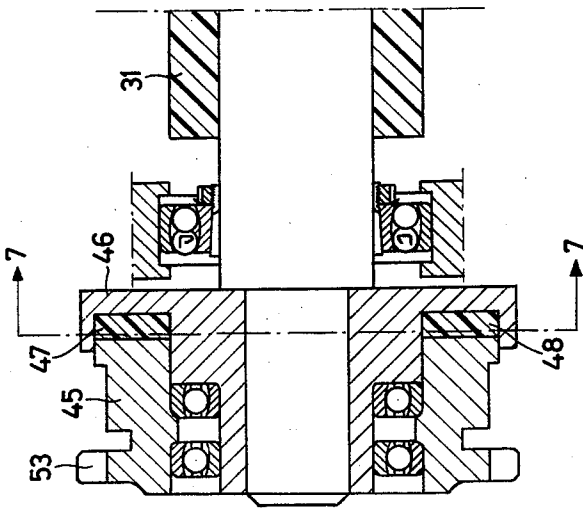


FIG. 6



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3,194,553 FEEDING MECHANISM FOR STACKED ARTICLES

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2 Claims. (Cl. 271—41)

This invention relates to a mechanism for feeding stiff articles such as carton blanks for a carton manufacturing machine out from a stack of such articles. The object of the invention is to provide a feeding mechanism which as compared with previously known mechanisms is considerably simpler and less expensive as well as effective and reliable in operation without damage to the articles delivered from the stack.

Previously known mechanisms for instance for feeding the lowermost carton blank out from a stack of such blanks to a carton manufacturing machine are operating in accordance with different principles. For example, the blanks are delivered from the stack by means of a pusher arm having a shoulder or projection which grips the rear edge of the lowermost carton blank. The pusher arm either exerts an impulse to the carton blank so as to move the blank in between two conveying rollers disposed ahead of the stack or makes so long a movement as to advance the blank out from the stack. This mechanism suffers from the inconvenience that the carton blank especially if it is thin, is likely to be bent under the action of the force exerted on the rear end of the blank. In other mechanisms friction belts, for instance of rubber, are used which run below the entire stack and entrain the lowermost carton blank. This feeding method has the disadvantage that the weight of the stack urges the lower side of the next succeeding carton blank against the rubber belts as soon as the lowermost carton blank has been advanced some distance by the belts. Since the stack may be relatively heavy and since the rubber belts are running at high speeds, it will be obvious that the next succeeding carton blank prior to the start of its forward movement will be subjected by the rubber belts to considerable wear which in certain cases may be serious enough to damage the carton blank which consequently cannot be used for its purpose. Another disadvantage of this mechanism consists in that the delivered carton blanks are following closely one after the other which is not desirable since there should be certain small intervals between the carton blanks as they pass through the machine. In known feeding mechanisms of the kind in consideration comparatively complicated devices are required to obtain such intervals.

This invention relates to a mechanism for feeding relatively stiff articles such as carton blanks for a carton manufacturing machine out from a stack of such articles, and the mechanism according to the invention comprises in combination a feed member disposed below the forward end of the stack for feeding the lowermost article out from the stack, a sloping plane disposed at the rear lower end of the stack, said feed member and said sloping plane being the only elements which support the weight of the stack and a rigid guard disposed in front of the stack and the lower edge of which has a bevel and is located at a vertical distance from the feed member equal to or slightly exceeding the thickness of an article, the arrangement being such that the rear part of the upper side of the lowermost article is brought out of surface contact with the lower side of the superposed article when the feed member starts to feed the lowermost article by frictional engagement with the lower side thereof.

In a mechanism according to the invention a great part of the friction between the articles which is being discharged and the superposed article is eliminated and the power required for feeding is consequently considerably reduced as compared with conventional mechanisms. Also the risk of bending or damaging an article which is being discharged is considerably reduced, resulting in a more reliable discharging operation than hitherto possible.

As a matter of fact the sloping plane disposed at the rear lower end of the stack in combination with the bevelled front guard is the simplest conceivable means which renders possible that the rear part of the article the feed of which has been started by the feed member is brought out of surface contact with the superposed article because the rear part of the lowermost article is meanwhile permitted to move downward and because the sloping plane serves as a support for the stack due to the fact that the superposed article has no possibility of moving forward between the front guard and the sloping plane except for a distance allowed by the level of the front guard. If the sloping plane is very steep the rear parts of a plurality of articles can be brought out of surface contact with each other in the lower part of the stack. This holds true of the uppermost article the lower rear side of which is not in surface contact with the rear part of the upper side of the underlying article.

Due to the fact that at the start of the feeding movement the feed member engages solely the forward part of the lower side of the lowermost article the superposed article will not be subjected to wear when the lowermost article has been slightly advanced by the feed member. It will be apparent that the feed member acts at the place only where about half of the weight of the stack gives rise to the necessary friction between the article which is being discharged and the feed member.

According to an embodiment preferred in practical use the feed member consists of a simple roller which is covered with rubber and the axis of which is located substantially right below the forward end of the stack. This embodiment in which the feeding operation occurs due to the cooperation of the sloping plane, the downwardly bevelled front guard and the feed roller constitutes a considerably simpler and less expensive structure as compared with previously known feeding mechanisms. In addition the mechanism operates more reliably and the articles are not subjected to the risk of damage during the discharge operation. The use of a roller as a feed member also renders possible the advantage to be described more closely hereinbelow and consisting in that the discharge operation in a simple manner can be carried out such that the articles will be advanced at certain intervals which would be much more difficult with the use of a feed member of more complicated shape.

Additional features of the invention will become apparent from the following detailed description of an embodiment of the invention. The feeding mechanism according to the embodiment exemplified is associated with a carton manufacturing machine and the delivered articles are carton blanks which in subsequent operation of the machine among other things are to be folded and glued. However, the invention is not limited to the feeding of carton blanks and the inventive idea is applicable to other similar stiff articles.

FIG. 1 is a lateral elevation of the fore part of a carton manufacturing machine in connection with a feeding mechanism in accordance with the present invention, FIGS. 2 to 5 are skeleton diagrams of the essential parts of the invention illustrating the feeding operation in detail, FIG. 6 is a diagrammatic view of a clutch connected to the feed roller, and FIG. 7 is a sectional view taken along the line 7—7 of FIG. 6.

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A stack at a feeding mechanism according to the invention comprises a plurality of carton blanks. The uppermost of these blanks is denoted at 1a, the underlying carton blanks are denoted at 1b and the lowermost but one carton blank in the stack is denoted at 1c. In FIGS. 1 and 2 the carton blank which is just about to be discharged is denoted at 1d. Below the forward part of the stack there is provided a movable feed member in the form of a roller 31 which is covered with rubber or similar material. Ahead of the stack there is provided a front guard 3 which at its lower end defines a throat opening for the lowermost of the stacked carton blanks. The height of the throat opening corresponds to the thickness of the carton blank. The lower edge of the front guard has a bevel 35 the function of which will be described later on. A sloping plane 30 serves as a rear support for the stack. The rear part of the lowermost article 1d is separated from the stack. Two conveying rollers 32 and 33 forming a pair of rollers are disposed at a short distance forwardly of the feed roller 31. These conveying rollers are continuously rotating at a speed somewhat higher than the speed of the feed roller 31. The rollers 31, 32, 33 are driven in a conventional manner by means of chains and a drive motor, not shown, associated with the carton manufacturing machine. The drive system is of conventional type and forms no part of the invention. The feed roller 31 is provided with a clutch device (FIGS. 6 and 7) which permits the feed roller to rotate at a speed higher than its normal speed under the action of a device other than the ordinary driving device. The construction of the clutch is such that when said other not ordinary driving device ceases to act the speed of the feed roller will be reduced by friction etc., whereupon after a short time the ordinary driving device again begins to actuate the roller 31. The speed of the roller 31 may have been reduced as far as to zero before the ordinary driving device again imparts the normal speed to the roller. To this end the clutch may consist of two parts 45, 46. The clutch part 45 is provided with clutch members in the form of two dogs 47, 48 which engage circularly extending arcuate slots 49, 50 in the other clutch part 46. Inserted in the slots are rubber blocks 51, 52 which in the driving position (FIG. 7) are engaged by the dogs. The ordinary driving device comprises a chain not shown, which runs over a toothed rim 53 on the clutch part 45.

The sloping plane 30 is mounted for pivotal movement on a shaft 37 so that its angle of inclination can be adjusted to have the mechanism operate in the best possible manner. The horizontal distance between the sloping plane and the front guard 34 is adjustable in accordance with the lengths of the blanks. To this end the shaft 37 about which the sloping plane is adjustable is mounted at its ends in two vertical brackets 38 connected to horizontal racks 39 which are mounted between rollers 41 in the frame 40 of the machine. By means of a pedal-operated detent 42 the stack can be raised in order to interrupt the feeding operation.

The feed roller 31 and the conveying rollers 32 and 33 are mounted for vertical adjustment in the frame of the machine.

The mode of operation of the feeding mechanism will best be seen from FIGS. 2 to 5 which illustrate the essential parts only of the invention.

In the position shown in FIG. 2 the feed roller 31 has just come into frictional engagement with the lowermost carton blank 1d and has started discharging this blank. In this position the weight of the stack is supported partly by the sloping plane 30 which engages the rear edge of the carton blank 1c and partly by the feed roller 31 which sustains the carton blank 1d which is being delivered. Since the forward part of the carton blank 1c rests on the carton blank 1d the remainder of the weight of the stack is supported by the feed roller. In the position shown in FIG. 3 the conveying rollers 32 and 33 have come into engagement with the carton blank 1d which is consequently advanced at a speed equal to the peripheral speeds v_2 of

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the conveying rollers. This speed is somewhat higher preferably about 10% higher than the peripheral speed v_1 of the feed roller. In the position shown in FIG. 3 the forward part of the carton blank 1c rests on the rear part of the carton blank 1d. The lower side of the carton blank 1d rests on the feed roller 31 which consequently still supports part of the weight of the stack. In consequence thereof the above described clutch device begins to operate resulting in that the carton blank 1d transmits the speed v_2 of the conveying rollers to the feed roller 31 and the higher speed of the conveying rollers will momentarily be imparted to the feed roller.

In the position shown in FIG. 4 the carton blank 1d has been further advanced between the conveying rollers and its rear edge has just before left the feed roller 31. Now the speed of the conveying rollers is no longer transmitted to the feed roller 31 which has started to retard. In FIG. 4 the speed of the feed roller is indicated at v_3 this speed being lower than v_2 . As soon as the carton blank 1d is discharged from the stack the forward parts of all of the blanks in the stack begin to drop down by gravity. In the position shown in FIG. 5 the forward edge of the carton blank 1c has dropped onto the feed roller 31 which momentarily is rotating at a speed v_4 slightly lower than the speed v_3 . The feed roller now engages the lower side of the forward part of the carton blank 1c. Due to the engagement of the rear edge of the blank 1c with the sloping plane 30 the blank can be advanced and its rear edge is separated from the rear edge of the next succeeding carton blank 1b which at the same time drops onto the sloping plane 30 and is stopped thereby.

Part of the weight of the stack acts upon the carton blank 1c until the carton blank 1b is stopped by the sloping plane 30. As soon as the rear parts of the blanks 1b are separated from the blank 1c the friction between the carton blanks 1b and 1c ceases to act except for the friction between the forward parts of these blanks. Now the feed roller can complete the discharge of the carton blank 1c because the weight of the stack acts on the emerging carton blank 1c solely in the region immediately above the feed roller resulting in an increased engagement of the feed roller with the carton blank 1c whereas all of the other braking frictional action between the upper side of the carton blank 1c and the lower side of the blank 1b is eliminated.

Immediately thereafter the previously described clutch device imparts the normal speed v_1 to the feed roller and the sequence of events will be repeated for each succeeding carton blank in the stack.

By adjusting the angle of inclination of the sloping plane 30 and the slope and vertical extension of the bevel 35 at the lower part of the front guard 34 a plurality of articles can be correspondingly separated from each other. However this modification does not involve any fundamental difference from the above described mode of operation.

Due to the described difference in speed between the conveying rollers 32, 33 and the feed roller 31 in combination with the clutch device of the feed roller an interval has been established between the articles 1d and 1c, said interval or distance being dependent on the lengths of the articles and the difference in speed between the conveying rollers and the feed roller. For instance if the difference in speed is 10% and the length of the article is 2 feet said distance will be about 2 inches and $\frac{3}{8}$. The invention consequently also provides a simple mechanism for spacing apart the discharged articles in proportion to their lengths.

Preferably the vertical extension of the bevel 35 equals twice the thickness of a delivered article. In consequence thereof at least two carton blanks will always be in contact with the bevelled surface whereby the discharging operation is facilitated. In the case of a smaller vertical extension of the bevel there arises the risk of disturbance of the delivering operation.

The mechanism according to the invention avoids the

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problem of sliding friction which occurs if the feed member consists of a belt abutting and dragging on the lowermost article. It will be apparent however, that the invention is equally well adaptable if the feed member consists of a belt which engages the forward end of the stack. If the sloping plane is turned to substantially horizontal position the feeding mechanism having a feed member in the form of a roller will not be able to function even if the stack abuts the outermost edge of the plane since the friction between the lowermost article and the stack is too high. If on the other hand the angle of inclination of the sloping plane to the horizontal is too great the sloping plane will not function as a sufficiently reliable support for the stack because too many articles would race down along the sloping plane. Practical tests have proved that the mechanism acts satisfactorily if the angle of inclination of the sloping plane is between 15° and 75° to the vertical. The mechanism also has proved operable if the point of the sloping plane which abuts the stack-supporting article is at a lower level than the top point of the feed roller. However, preferably both of said points are substantially on a level with each other or the rear point may be at a slightly higher level than the top point of the feed roller. The front guard may be replaced by a plurality of vertical bevelled front plates, and suitable adjustable lateral guides for the stack may be used.

What is claimed is:

1. In a mechanism for withdrawing relatively stiff articles, such as carton blanks for a carton manufacturing machine, from a stack of such articles, comprising a roller feed member having a surface covering of a friction ma-

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terial, which feed member is disposed below the forward end of such stack for frictional engagement only with the forward end of the lower side of the lowermost article of such stack, and a rigid guard disposed in front of such stack above the feed member which guard is located at a vertical distance from the feed member at least equalling the thickness of one article: in combination a bevel at the lower edge of said rigid guard and a stationary sloping plane at the rear lower end of the stack substantially on level with the bevel, said sloping plane and said feed member carrying the entire weight of the stack, said bevel and said sloping plane providing for the elimination of friction between the rear portion of a carton blank to be withdrawn and the superposed blank when the feed member starts to withdraw the lowermost blank by frictional engagement at its forward end of the lowermost side.

2. The mechanism defined in claim 1, wherein the vertical extension of the bevel does not exceed twice the thickness of the article.

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