May 11, 1937. G. W. SWIFT, JR 2,079,668

BLANK FEEDING MECHANISM FOR PRINTER SLOTTERS

Filed June 1, 1935 3 Sheets-Sheet 1

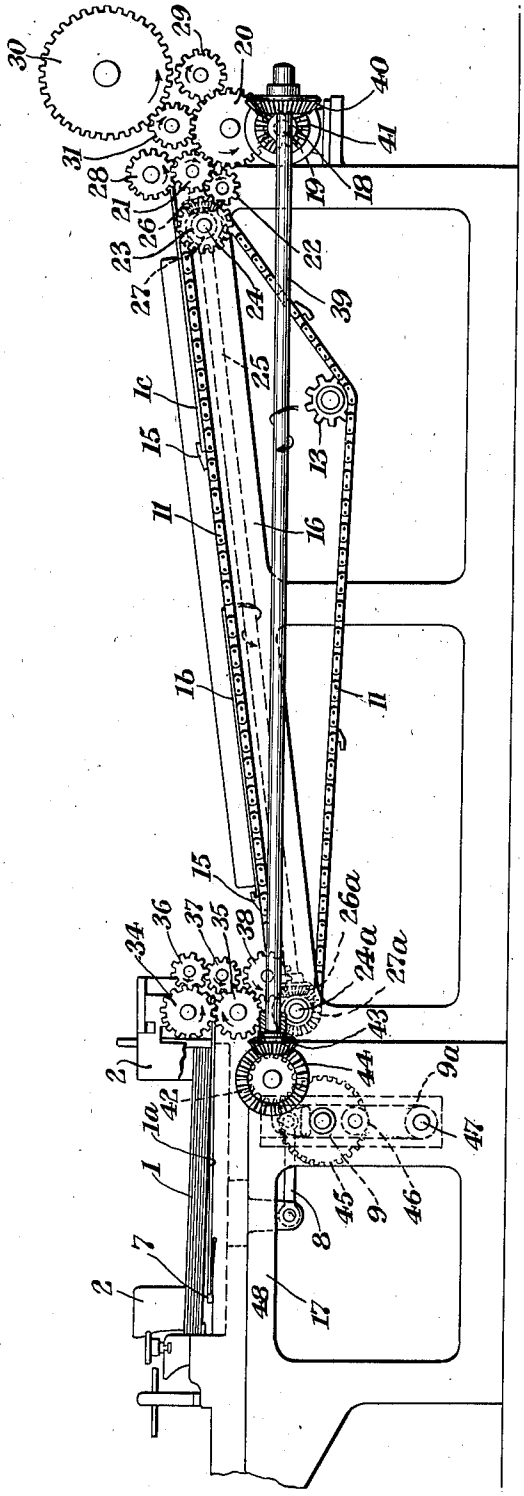

Fig. 1.

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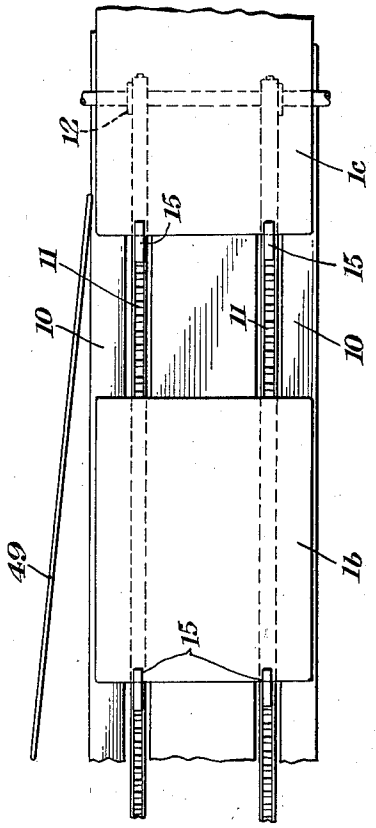

Fig. 2

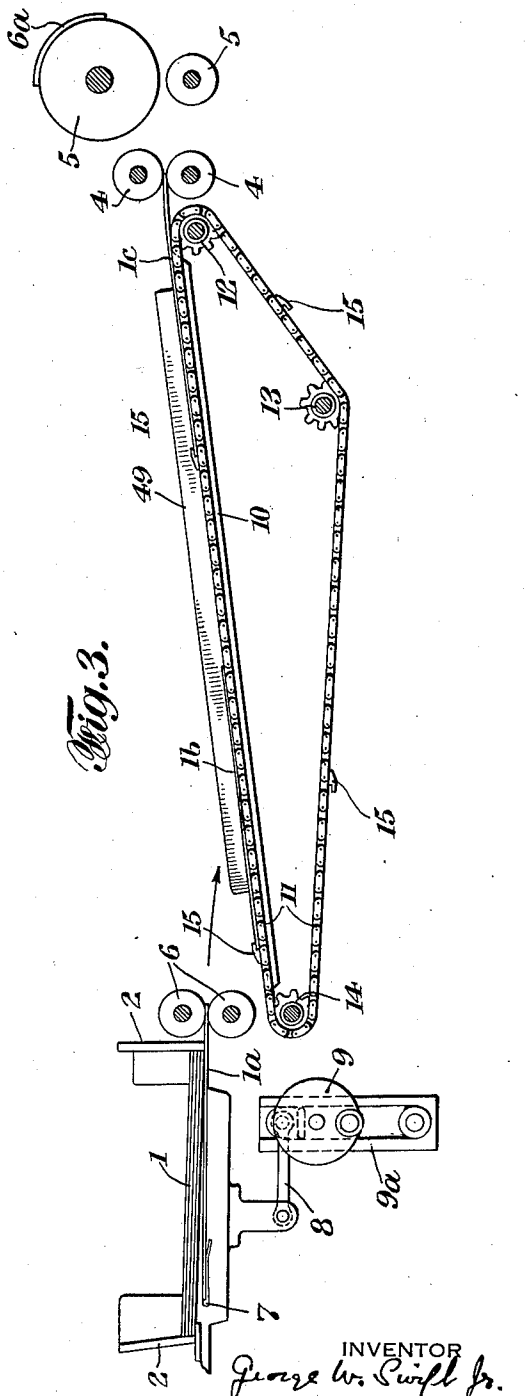

Fig. 3.

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Filed June 1, 1935 3 Sheets-Sheet 3

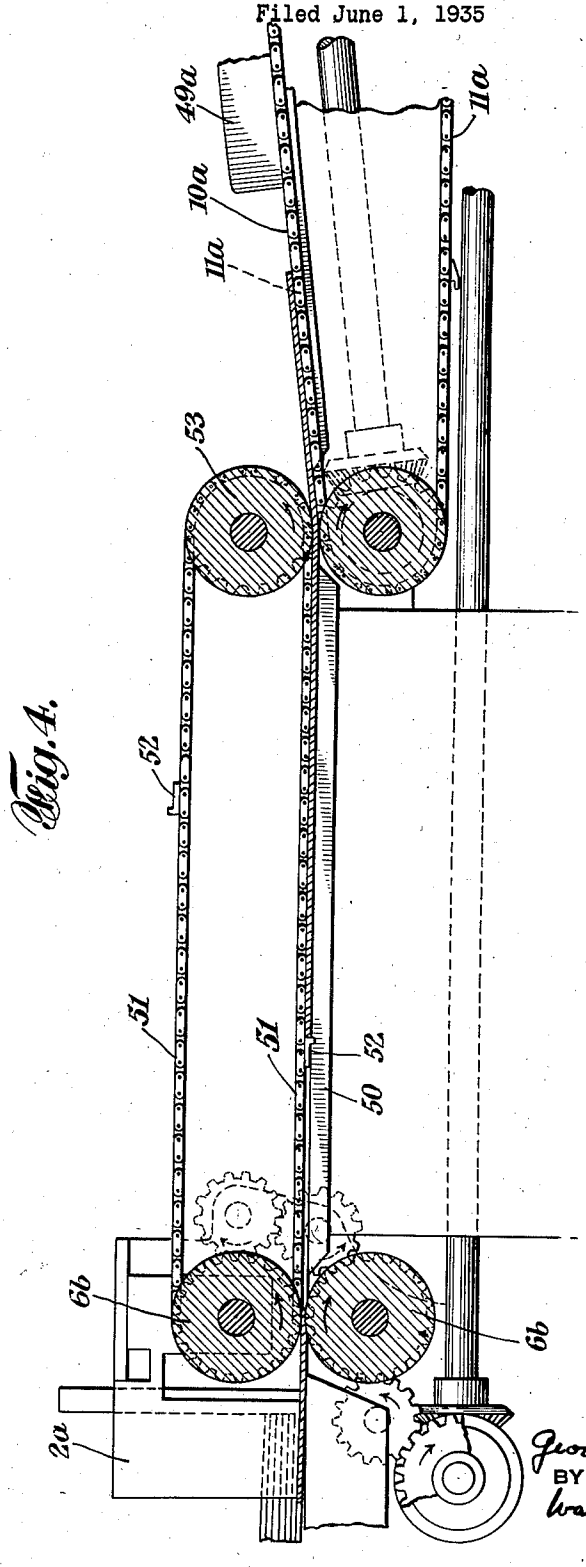

Fig. 4.

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BLANK FEEDING MECHANISM FOR PRINTER-SLOTTERS

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5 Claims. (Cl. 271—10)

The invention aims primarily to provide a blank feeding mechanism which will feed the blanks very precisely under the special conditions and requirements existing in connection with machines used for performing printing and/or slotting operations upon corrugated paper board box blanks. It is frequently required that the printed matter and/or the slots be quite accurately positioned on the blanks and efforts have been made to improve the operation of the machines in these respects by providing special adjustments of the printing dies or the cutters which cut out the slots. The accuracy of operation however is dependent as well upon the degree of precision with which the blanks are fed to the printing cylinders and/or slotting heads, and it is objectionable from the standpoint of injury to the corrugated paper board to apply a high pressure to the blanks in feeding them to the machine. The blanks should be fed to the operating parts of the machine by feed rolls which apply only a relatively light frictional pressure and accordingly inaccuracies in the positioning of the printed matter or slots may result as well from slippage in the feed as from inaccurate positioning of the printing dies or cutters; or with given settings of the main operating parts of the machine, variations in the position of the printed matter or slots on the blank may result solely from inaccurate feed. The above difficulties become accentuated under modern requirements of high speed operation.

I have found that the above inaccurate results may be largely avoided by providing a feeding mechanism which although seemingly objectionable because involving a substantial number of added parts and extra complication, is well worth while since it eliminates the primary cause of the above mentioned inaccuracies of feed. The blanks are fed to the machine successively from the bottom of a stack of blanks, and heretofore it has been the practice to employ a device such as a chain or knocker feed mechanism which periodically pushed the bottom blank partially out from under the stack into engagement with the feed rolls above mentioned, with the result that the feed rolls drew the blank the rest of the way out from under the stack, against the frictional pressure of the stack on the blank being fed. This pressure varies substantially during operation, depending on the weight of the stack and size of blank, and using the relatively light frictional pressure which it is feasible to apply to the blank by the feed rolls, I believe that the variable frictional resistance applied by the stack as aforesaid has been an important factor in producing slippage of feed which resulted in inaccurately positioned printed matter or slots. In any event I have found that if the feeding operation be sub-divided into stages, whereby the lowermost blank of the stack before being fed into the machine by the feed rolls, is preliminarily freed from the frictional pressure of the stack before engaging the main feed rolls, the above difficulties will be largely avoided. According to the present invention a pusher or "knocker" member is employed which partially pushes the bottom blank out from under the stack through a short distance to an intermediate feeding mechanism which then engages the blank, withdraws it clear from under the stack and feeds it to another blank advancing mechanism which in turn moves the blank into engagement with the main feed rolls of the machine. Accordingly the feed rolls do not have to feed the blank against variable frictional resistance, and an accurate feed may be obtained. The extra feeding steps of the invention thus are of advantage where a very precise feed is desired, and where the blanks are of a delicate material which must be fed by light frictional pressure as contrasted to heavy positive pressure. In the feeding of corrugated paper board and fiber board box blanks, it is customary to employ feed rolls having relatively soft yieldable surfaces engaging the blanks; these surfaces also tend to create irregularities in the feed which it is the object of the present invention to overcome. It may be noted in the above connection that under present day requirements for high speed operation it would be objectionable to use a direct feed of sufficient length and rapidity of action, to feed the blanks clear of the stack before engaging them with the feed rolls, on account of the likelihood of injury to the blanks. By dividing the feeding operation into stages as above outlined, this objection is avoided.

Further objects and advantages of the invention will be in part obvious and in part specifically referred to in the description hereinafter contained which, taken in conjunction with the accompanying drawings, discloses one form of mechanism for carrying out the successive feeding steps of the invention; such disclosure however is to be regarded merely as illustrative of its principles. In the drawings—

Fig. 1 is a side view illustrating more especially a driving gearing suitable for a mechanism operting in accordance with the invention.

Fig. 2 is a plan view illustrating more particu-

larly the part of the mechanism which advances the blanks to the main feed rolls.

Fig. 3 is a diagrammatic side view showing the successive feeding operations which are performed in accordance with the invention.

Fig. 4 is a view similar to Fig. 3 but showing a somewhat modified construction of blank feeding mechanism.

The main steps performed in carrying out the invention may be most readily understood by reference to Fig. 3 which shows in schematic form a feeding mechanism by which the corrugated paper board blanks of a stack 1 contained in a suitable frame or hopper 2 (which may be of known construction) are to be fed successively to the feed rolls 4 of a printer-slotter, which latter may also be of any suitable construction in respect to the rotary parts employed for printing on and/or slotting the blank. The rolls 5 shown at the right of Fig. 3 may be for example a set of printing rolls, the upper of which carries a printing die 6*a*, or the element 6*a* may be understood as a cutter for slotting the blanks. The feed rolls 4 should feed the blanks to the above mentioned rotary operating parts at the same surface or linear speed at which such parts rotate. Reference herein to printer-slotters should be understood as designating machines for performing either printing or slotting operations, or both, upon successively fed corrugated paper board blanks of like dimensions, the rotary operating parts in either event being driven in accurately timed relation to the feed rolls 4, so as to feed the blanks at the proper speed and at the proper times, to the operating parts of the machine.

The first step in the feed is to push the lowermost blank 1*a* of the stack partially out from under the stack. As shown in Fig. 3 this may be accomplished by a reciprocable pusher or "knocker" member 7 which moves relatively slowly in engaging the rear end of the blank 1*a*, although its motion may accelerate somewhat after the operation is started. As shown this pusher member 7 is operated by a connecting rod 8 driven from a rotary crank member 9 through a rocker arm 9*a*, the arrangement being such that the pusher member 7 is in a slow phase of its reciprocatory motion when it first engages the blank to avoid mashing the latter, but the motion may accelerate thereafter.

The first operation above described moves the projecting end of blank 1*a* into frictional engagement with an intermediate feeding mechanism which may be constituted by feed rolls 6, which pull out the blank with relatively light frictional pressure and complete its withdrawal from under the stack until it is clear of the latter. These rolls 6 preferably are speeded to feed the blank 1*a* somewhat faster than its rate of travel through the main machine typified by rolls 4 and 5, and some irregularity of feed at this preliminary stage is not objectionable, as hereinafter explained in greater detail.

By the above mentioned second step of the feed, the blank is fed onto a table 10 where it is engaged by a suitable blank feeding or advancing mechanism which conducts the blank into frictional engagement with rolls 4. The mechanism illustrated for this purpose is of the chain type, having chains 11 extending along table 10 and around sprockets 12, 13 and 14, carrying pusher bars 15 which successively advance the blanks after they are deposited on table 10 by the feed rolls 6. The specific construction of these members 15 is not described in detail herein since suitable forms are known in the art. The blank 1*b* is shown in dotted lines in Fig. 3 just prior to the stage when it is advanced by the pusher bar 15 shown behind it.

The last mentioned feeding mechanism is timed to advance the blanks at the same speed as they are fed to the main machine by feed rolls 4 and the blank 1*c* shown in dotted lines in Fig. 3 appears in the position assumed shortly after one of the pusher bars 15 has advanced it into frictional engagement with the feed rolls 4. Thus at the time the feed rolls 4 pick up the blank and feed it frictionally to the main operating parts of the machine, there is no variable frictional resistance or other variable drag on the blank which might cause it to slip back irregularly when fed forward by rolls 4. There may well be irregularities in the speed at which blanks are fed by rolls 6, but a substantial tolerance is afforded at this stage of the operation without producing any ultimate inaccuracies in the feed to the main machine, since so long as each blank arrives at the table 10 shortly ahead of the pusher bar 15 which is to advance it, its particular instant or arrival is immaterial.

Thus in the operation of the mechanism the pusher member 7 will be timed to operate in accordance with the rapidity of the working strokes of the pusher bars 15, which preferably run at a speed corresponding to the rate of feed of rolls 4, and the feed rolls 6 are operated fast enough to insure that each blank will arrive at the table 10 within the permissible time limits.

As above stated the operation of initially pushing the bottom blank partially out from under the stack 1 need not injure the blanks even though the remaining operations are carried out at high speeds, since the distance through which the blank has to move in this initial operation is relatively small and accordingly the motion may be relatively slow, or with gradual acceleration. The second operation of withdrawing the blanks entirely clear of the stack, performed in the above described embodiment of the invention by rolls 6, is merely a pulling operation which also is not likely to injure the blanks even though carried on at high speed. When engaged by the pusher bars 15, the blanks are substantially free and unrestrained, and accordingly the pusher bars 15 may be operated at high speeds without injury to the blanks. If it were attempted to transfer the blanks directly from underneath stack 1 to feed rolls 4, by the pusher bars 15, using a chain long enough to clear the blanks entirely from under the stack before engaging the above-mentioned rolls, the bars 15 would be likely to injure the edges of the blanks under high speed operating conditions, and other operating objections would be entailed which are avoided by operating in stages as above described.

In Figs. 1 and 2 I have illustrated gearings suitable for driving in properly timed relation, the parts of the machine which have been generally described in connection with Fig. 3. The blank advancing mechanism above described may be carried by a frame indicated at 16, and the hopper, preliminary feed rolls 6, and associated parts by a frame 17. Assuming that power for the machine as a whole is supplied to a cross shaft 18 at the delivery end of frame 16, power for the chains 11 may be taken off through a train of gears 19, 20, 21, 22, and 23, thus to turn the spindle 24 at the delivery end of chains 11, this spindle carrying suitable sprockets (not illus-

trated) for driving the chains. An intermediate shaft 25 may also be provided, and driven from shaft 24 through the beveled gears 26 and 27, to deliver power to a cross shaft 24a at the opposite extremity of chains 11, through similar beveled gears 26a and 27a.

The gear 21 above described directly drives the lower main feed roll of Fig. 3, and the upper main feed roll 4 is driven by a gear 28 (Fig. 1) which engages gear 21. Thus the chain feeding members 11 and the main feed rolls 4 are properly coordinated. The lower roll 5 (Fig. 3) of the machine proper may be driven by a gear 29 (Fig. 1) which engages the gear 20 previously described, while the upper roll 5 may be driven by means of a gear 30 coaxial therewith, which is connected to gear 20 through a gear 31. These gearings coordinate the main operations of the machine with the feed rolls 4 and chain feed members 11, as to speed and timing.

The preliminary feeding rolls 6 (Fig. 3) may be driven by gears 34 and 35 on their respective shafts, which gears engage respectively with the intermediate gears 36 and 37. The gear 35 is driven from shaft 24a through a gear 38 and a further gear (not illustrated) on shaft 24a which engages gear 38. The ratio of this last described gearing preferably is such that the feed rolls 6 advance the blanks at a speed somewhat greater than the travel of the chain feed members 11.

The knocker feed member 7 may also be driven from shaft 18, through an intermediate shaft 39, connected to shaft 18, by beveled gears 40 and 41, and driving a spur gear 42 at its opposite end through beveled gears 43 and 44. The spur gear 42 in turn drives a gear 45 which rotates with the crank 9 (Fig. 3). This crank carries a crank pin 46 which oscillates the rocker arm 9a and is pivoted at 47. The connecting rod 8 is extended between the rocker arm 9a (as shown in Fig. 3) and a reciprocating table 48 by which the feed member 7 is carried, and thus the action of feed member 7 is properly timed with respect to the chain feed members 11 and the other operating parts of the machine.

As indicated in Fig. 2 the table 10 may be provided with a suitable side guide 49 to insure proper alinement of the blanks with the operating members of the main machine, when the blanks are fed to main feed rolls 4 by chains 11.

In the form of the invention shown in Fig. 4 the feed rolls 6b should be regarded as corresponding to the rolls 6, that is they receive the blanks successively as partially pushed out in suitable manner from underneath the stack in hopper 2a, but in this instance an intermediate feeding mechanism is interposed between the feed rolls 6b and the blank advancing mechanism indicated at 11a as working over a table 10a; these members are similar to the members 10 and 11 previously described in connection with Figs. 1 to 3. As shown in Fig. 4 a table 50 is located on the delivery side of feed rolls 6b, and supplementary feeding chains 51 having pusher bars 52 thereon, are driven by the shaft of the upper feed rolls 6b, the chains 51 also passing around suitable sprockets 53 located above the entrance end of table 10a. The pusher members 52 are thus synchronized with the feeding devices which precede and follow them, and in the use of this form of the invention, the preliminary feeding devices may be placed in line with the table 10a so that the blanks are fed substantially at one level. A side guide 49a may be employed similar to the member 49 above described.

Since suitable "knocker feed" and chain feed mechanisms per se are well known in the art, they have not been described in great detail herein, the present invention being more particularly concerned with the coordination of feeding mechanisms, which may be individually known, to feed the blanks by successive steps as above described, in such a way as to insure greater precision of timing in the delivery of the blanks to the main operating parts of the machine.

While the invention has been described above as carried out by a feeding mechanism of a particular construction, it should be understood that many changes may be made therein without departing from the invention in its broader aspects, within the scope of the appended claims.

I claim:

1. A mechanism for feeding blanks to a corrugated paper board printer-slotter machine having frictional main blank feeding rolls, means for driving said rolls in timed relation to the parts of the machine which perform the desired operations on the blank, a chain feed mechanism for the blanks located immediately in advance of said feeding rolls and having means for driving it at a speed approximating the rate of travel of the blanks through said main feeding rolls, said mechanism having pushers constructed to engage behind the rear of the blanks to be fed, intermediate feed rolls located in advance of the blank-receiving portion of said chain feed mechanism, a frame located in advance of said intermediate feed rolls and constructed to support a stack of blanks to be fed, a feed member working underneath said frame and constructed to push against the rear end of the bottom blank of the stack to move said blank partially out from underneath the stack to said intermediate feed rolls, driving means for said feed member engaging the same relatively slowly with the bottom blank as compared to the rate of travel of the blanks through the main feeding rolls, and means for driving said intermediate feed rolls to feed blanks at a speed in excess of the rate of travel of said chain feed mechanism, said feed member and intermediate feed rolls being coordinated to feed the blanks to points on the chain feed mechanism which are somewhat in advance of said pushers.

2. A mechanism for feeding blanks to a paper board printer-slotter machine having frictional main blank feeding rolls, means for driving said rolls in timed relation to the parts of the machine which perform the desired operations on the blank, mechanism for periodically advancing blanks into engagement with the above mentioned main blank feeding rolls, said mechanism having pushers constructed to engage behind the rear of the blanks to be fed, a frame constructed to support a stack of blanks to be fed, and a blank prefeeding mechanism for periodically feeding the lowermost blank of the stack to the aforesaid blank advancing mechanism including a pusher member constructed and arranged to engage the bottom blank of the stack individually and move such blank partially out from under the stack, means for operating said pusher member in timed relation to the above mentioned blank advancing mechanism, and means acting to engage the forward portion of the lowermost blank as partially moved out from under the stack by the pusher member and draw the blank clear of the stack before being engaged by said blank advancing mechanism, said prefeeding mechanism being constructed and coordinated

to deliver the blanks to points on the blank advancing mechanism slightly in advance of said pushers.

3. A mechanism for feeding blanks to a paper board printer-slotter machine having frictional main blank feeding rolls, means for driving said rolls in timed relation to the parts of the machine which perform the desired operations on the blank, mechanism for periodically advancing blanks into engagement with the above mentioned main blank feeding rolls, said mechanism having pushers constructed to engage behind the rear of the blanks to be fed, a frame constructed to support a stack of blanks to be fed, means for periodically engaging the bottom blank of the stack individually and moving said blank partially out from under the stack, feed rolls for engaging the forward portion of said bottom blank when so partially pushed out and pulling it clear of the stack, said blank engaging means and feed rolls being positioned and coordinated to deliver the blanks to points on the aforesaid blank advancing mechanism which are slightly in advance of said pushers.

4. The method of feeding paper board box blanks successively from underneath a stack of such blanks to frictional main feed rolls of a machine for operating on the blanks, which includes pushing against the bottom blank of the stack to move said blank partially out from under the stack, then grasping the projecting portion of the blank and drawing the blank free of the stack, and then depositing the freed blank upon a blank advancing mechanism which leads to the main feed rolls, at a point slightly in advance of the blank engaging parts of said blank advancing mechanism.

5. A mechanism for feeding blanks to a paper board printer-slotter machine, having frictional blank feeding rolls, means for driving said rolls in timed relation to the parts of the machine which perform the desired operations on the blank, means for supporting a stack of blanks to be fed, blank prefeeding mechanism including means periodically engageable against the bottom blank of such a stack for initiating the feeding motion of the blank, and a blank advancing mechanism constructed to subsequently engage the blank, said blank advancing mechanism having a pusher constructed to engage behind the blank and acting to advance the blank into engagement with said main blank feeding rolls after the blank has been cleared of the stack, said prefeeding mechanism being constructed to deliver the blank to a point on the blank advancing mechanism which is slightly in advance of said pusher.

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