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O. D. JOHNSON ET AL
CARD FEEDING MECHANISM

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2 Sheets-Sheet 1

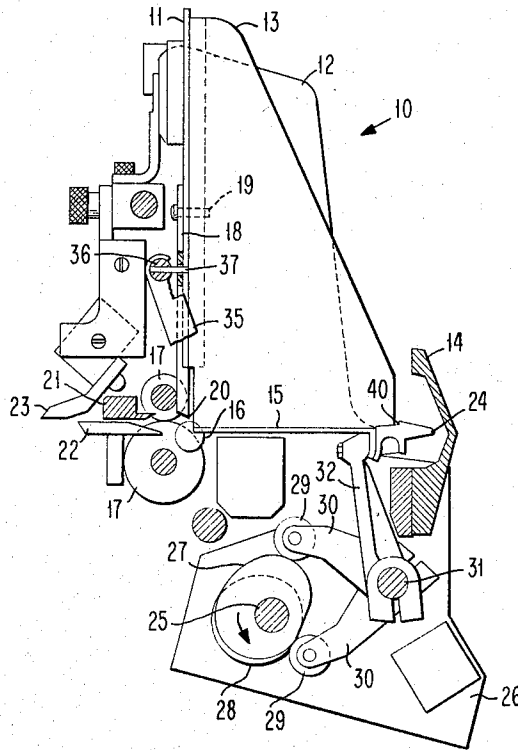


FIG. 1

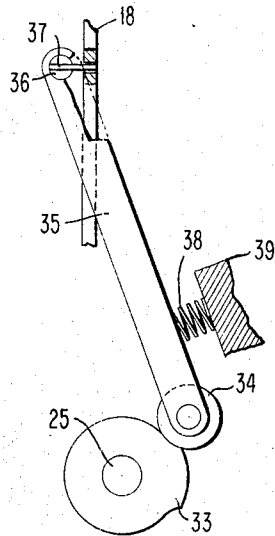


FIG. 2

INVENTORS
OLIVER D. JOHNSON
DAVID W. LEACH

BY

G. R. Gagger
AGENT

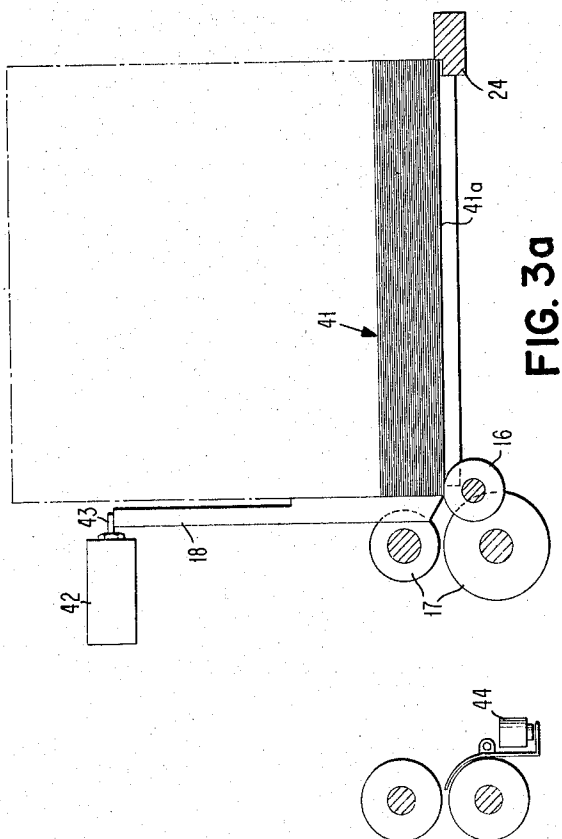
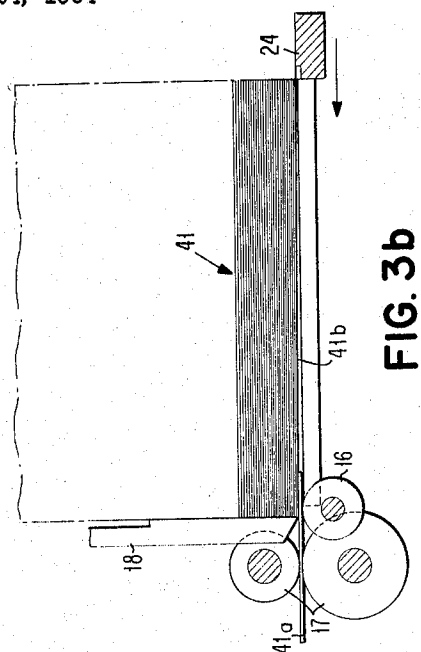
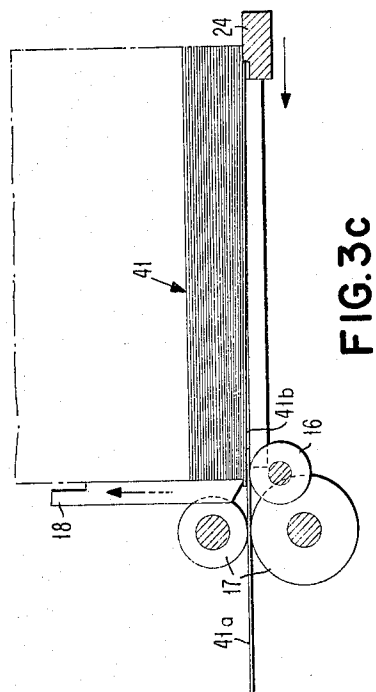
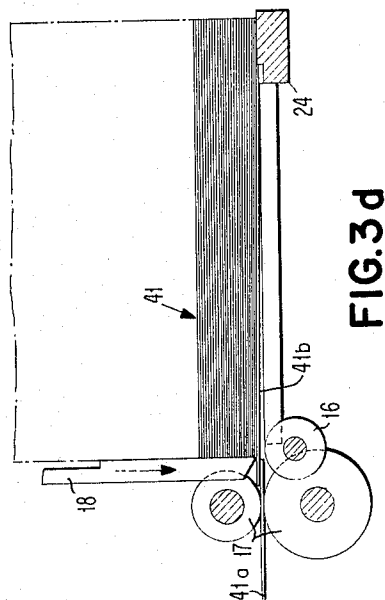
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CARD FEEDING MECHANISM

Oliver D. Johnson, Vestal, and David W. Leach, Endwell, N.Y., assignors to International Business Machines Corporation, New York, N.Y., a corporation of New York

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3 Claims. (Cl. 271-44)

This invention relates to high speed card feeding mechanisms for business machines and more particularly to a card feeding mechanism for feeding tabulating cards and the like out of a hopper in overlapping relationship.

One important and useful application of the present mechanism is in connection with high speed rotary continuous forms assembly machines of the type currently in use to produce continuous form stationery comprising continuous form connected tabulating cards. This type of continuous form stationery is fully shown and described in U.S. Patent 2,700,556 which issued on January 25, 1955. In the production of this stationery, a tabulating card blank is provided with separable top and bottom strips each having an area of adhesive thereon for connection to similarly constituted blanks to form a continuous web of series connected blanks. The two opposite faces of the end strips are provided with adhesive so that the opposite end of an adjoining blank may be connected thereto in a shingled fashion so that successive blanks overlap each other in a similar fashion.

Heretofore, in assembling the continuous forms, cards were fed successively out of a card hopper with approximately a $\frac{3}{4}$ inch gap between cards and a second mechanism was utilized to overlap the cards. The overlapping of successive cards proved to be a very critical operation especially at high speeds and a stop and go type of operation had to be employed which limited the speed of operation of the assembly machine to the relatively slow speed of 200 cards per minute. Since each card had to be stopped at the overlapping station to allow the following card to catch up and reach an overlapping relationship with the stopped card, any attempt to increase the speed of operation of the assembly machine resulted in damage to the card edge, card jams and card registration problems.

In attempting to improve on the prior art method of continuous card form assembly it was found that by feeding the cards in overlapping relationship out of the card hopper the above problems were eliminated and the speed of the assembly operation could be increased five times to a speed of 1000 cards per minute. This significant increase in production performance, of course, is extremely desirable in meeting the ever increasing demand in the market place for continuous form stationery. To accomplish this, the present novel card feeding mechanism is provided with a card feed throat varying device which works in co-operation with the card feed knives to allow cards to be fed from the card feeding mechanism with a predetermined amount of overlap. The card feed knives are operated faster than usual with respect to the exit feed rollers so that successive cards will overlap prior to exiting out of the card feed throat and the throat knife mechanism is cam operated to allow the overlapped cards to be fed out. This approach can be used to overlap record cards or any similar document sheets that would normally be fed from a card feed unit or similar feeding device. The present im-

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proved mechanism will reliably and accurately provide a predetermined amount of card overlap. It also has the added advantage of being able to directly feed overlapped cards onto a belt, pin feeding chain, or the like with no change in speed and no intermediate overlapping mechanism required. As a result, the present mechanism solves a basic problem of passing the leading edge of a card over the trailing edge of the card preceding it which is necessary in the continuous forms assembly operation.

Accordingly, a principal object of the present invention is to provide an improved feeding mechanism for feeding record cards or the like with a predetermined amount of overlap.

A further object of the present invention is to provide a feeding mechanism for directly feeding overlapped cards or sheets onto a belt, pin feed chain, or the like with no change in speed and no intermediate overlapping mechanism.

A still further object of the present invention is to provide a card feed unit having a cam operated throat knife mechanism to allow overlapped cards to be fed from the unit.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a sectional side elevation view of a card feeding mechanism embodying the principles of the present invention.

FIG. 2 is a detail view of the cam operated mechanism for operating the throat knife of the feeding mechanism shown in FIG. 1.

FIGS. 3a-3d illustrate the relationship between the card feed knives, the cards, and the throat knife during a feeding operation.

Referring to FIG. 1, the card feeding mechanism comprises a hopper 10 which is, in general, constructed in the same manner as prior hoppers and contains a hopper front wall 11, hopper side walls 12 and 13, and a pair of hopper posts 14 arranged laterally across the back of the hopper. These define the hopper and are slightly larger than the cards so that they can be joggled to avoid card jams.

The hopper is provided with a bed plate 15 and arranged across the front edge of the bed plate are at least two rotatable card support rollers 16 and at least two pairs of exit feed rollers 17. A throat knife blade 18 is slideably mounted on a stud 19 fixed to the front wall 11 and terminates into a knife edge 20 to form a throat with the support rollers 16. Beyond the exit feed rollers 17 there are provided suitable guide members 21, 22 and 23 which form a throat chute to provide card guidance to whatever card transport means is being fed.

In order to remove the bottom-most card from a deck of cards placed in the hopper, at least two picker knives 24 are arranged laterally across the back edge of the bed plate 15. The picker knives are oscillated to and fro in suitable cutout portions of the bed plate by a drive mechanism such as a constant speed motor (not shown) which drives a cam shaft 25 suitably journaled in side plates 26 of the mechanism. Fastened on the cam shaft 25 are a pair of cams 27 and 28 which are designed to give the picker knives the proper timing for picking the cards in

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relation to the other operations that are to be performed. Followers 29 are provided to ride on the cam surfaces and are mounted on lever arms 30, which lever arms are clamped to a rotatable picker knife drive shaft 31. Clamped to the picker knife drive shaft are a pair of picker knife arms 32 each one of which is suitably connected to a picker knife 24. This arrangement oscillates the picker knives when driven by the drive mechanism. It will be understood that the number of picker knives used may vary depending upon the width of the documents that are to be fed.

In accordance with the principles of the present invention, a throat varying mechanism is provided to allow the cards to be fed out of the hopper in overlapped fashion. Referring to FIG. 2, a throat varying cam 33 is fastened on the picker knife cam shaft 25 and driven in unison with the picker knife cams 27 and 28. A follower 34 is provided to ride on the cam surface and the follower is mounted on one end of a lever arm 35. The other end of the lever arm is fastened to a suitable journaled rotatable shaft 36. Fastened on the shaft 36 is a pin 37 which extends into a hole in the throat knife blade 18 for the purpose of raising and lowering the knife blade in response to the contour of the cam 33. A spring 38 is positioned between the lever arm 35 and a rigid member 39 to urge follower 34 against the surface of cam 33.

In the continuous form shown in the aforementioned U.S. Patent 2,700,556, which form was chosen to illustrate one application to which the present invention may be put, the individual record cards have a thickness of about .007 of an inch and for handling stock of this type the picker knife surface 40 itself runs from about .005 to .006 of an inch. For this application, then, the throat knife blade 18 would be set so that when follower 34 is on the low surface of cam 33 the throat clearance between the knife edge 20 and the support rollers 16 will be from .009 to .010 of an inch. This is sufficient clearance to allow the passage of one card thickness but insufficient for two card thicknesses. In addition, the drive mechanism is such that the cam shaft 25 and cams 27, 28 and 33 are rotated faster than the exit feed rollers 17 so that the cards will be fed with an overlap of approximately .190 of an inch.

In the operation of the mechanism, a stack of cards 41 is placed in the hopper so that the picker knives 24 can operate on the bottom-most card. The action of the followers 29 on the cams 27 and 28 oscillates the picker knives 24 and the bottom-most card is started out of the hopper by the picking knife surface 40 engaging the rear edge of the card and moving the leading edge through the throat and into the slower running exit feed rollers 17. The throat varying mechanism is timed so that on each forward stroke of the picker knives and just before the knives come into contact with the back of the card to be fed, the high lobe on cam 33 moves the lever arm 35 outward causing the shaft 36 to rotate counterclockwise and the pin 37 to raise the throat knife blade 18. The lobe is designed to raise the blade approximately .008 of an inch to bring the total throat clearance to about .018 of an inch which is sufficient to allow overlapped cards to pass. When the high lobe on the cam passes beyond the follower 34, spring 38 restores the mechanism lowering the throat knife blade to the normal .009 to .010 of an inch opening.

Referring to FIGS. 3a to 3d, there is shown the relationship between the card feed knives, the cards, and the throat knife during a feeding operation. The relationship in FIG. 3a shows the first card 41a about to be fed from the hopper. FIG. 3b shows the next card 41b almost ready to be fed as the preceding card 41a is still being moved through the throat gap. FIG. 3c shows the throat blade 18 in its raised position and the card 41b starting to be fed in overlapping relationship with the first card 41a. FIG. 3d shows the cam actuated throat knife 18 closing

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just after the double thickness has passed the throat knife to prevent the next card from feeding prematurely.

It should be noted that on the initial card feed cycle, illustrated in FIG. 3a, that unless some preventative action is taken, two cards might possibly be fed. It is desirable, then, to control the throat knife so that it will remain in the lower position until the first card is fed partially out of the hopper. One way this operation may be accomplished is to provide an air cylinder 42 having a plunger 43 which normally extends over the end of the throat knife 18 to lock the same in its down position prior to the first card feed cycle. When the first feed cycle starts, the throat knife remains locked in the down position and since there is only an .008 of an inch movement involved the stress created in lever arm 35 by the rotating cam 33 is taken up by the shaft 36. When the first card 41a feeds out a sufficient distance it will actuate a micro-switch 44 positioned in the feed path and the micro-switch is connected by suitable circuit means to cause the air cylinder 42 to retract the plunger 43 to free the throat knife for operation. When the last card to be fed passes beyond the micro-switch, the air cylinder will operate to lock the throat knife in its down position prior to the start of the next feeding operation.

It will be understood that by changing the picker knife cams 27, 28 and/or the speed of the cam shaft 25, the timing of the mechanism may be altered to feed documents with a butt-to-butt relationship or with a very small gap between them at high rates of speed in the order of 1000 cards per minute.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A form feeding mechanism comprising:

a hopper for supporting superposed forms;
a knife blade co-operating with one end of the hopper to define a throat for normally allowing the passage of only a single form;

picker means at the opposite end of said hopper for successively picking forms from the hopper during successive feeding strokes and advancing them past said throat; said picker means being effective to pick and advance only one form during each feeding stroke;

feed rollers adjacent the exit side of said throat for advancing said forms out of said throat and hopper; means for operating said picker means at a faster rate than said feed rollers to successively advance a form before a form leaves said throat and hopper whereby the trailing and leading edges of successive forms will overlap a predetermined amount prior to leaving the hopper; and

camming means reciprocating said knife blade for successively varying said throat to allow the successive passage of the overlapped portions of said forms.

2. A card feeding mechanism comprising:

a hopper for supporting superposed cards;
means co-operating with one end of the hopper to define a throat having a normal opening corresponding to slightly more than a single card thickness;
picker means having only a single card picking surface for engaging the trailing edges of successive cards and advancing them past said throat during successive feeding strokes;

means for advancing said cards out of said throat and hopper;

means for operating said picker means at a faster rate than said advancing means to successively advance a card before a card leaves said throat and hopper whereby the leading edge of each card will overlap the trailing edge of the preceding card by a pre-

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determined amount prior to leaving the hopper; and means operable just before said picker means engages the edge of each card to be fed for momentarily increasing said throat opening to slightly more than double card thickness to allow the successive passage 5 of the overlapped portions of said cards.

3. A card feeding mechanism as defined in claim 2 and including means effective at the start of a first card feeding cycle for preventing operation of said throat increas-

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ing means until the first card fed has advanced out of the hopper a predetermined amount.

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