

Jan. 2, 1962

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3,015,485

SHEET FEEDING AND REGISTERING MACHINES

Filed July 23, 1958

7 Sheets-Sheet 1

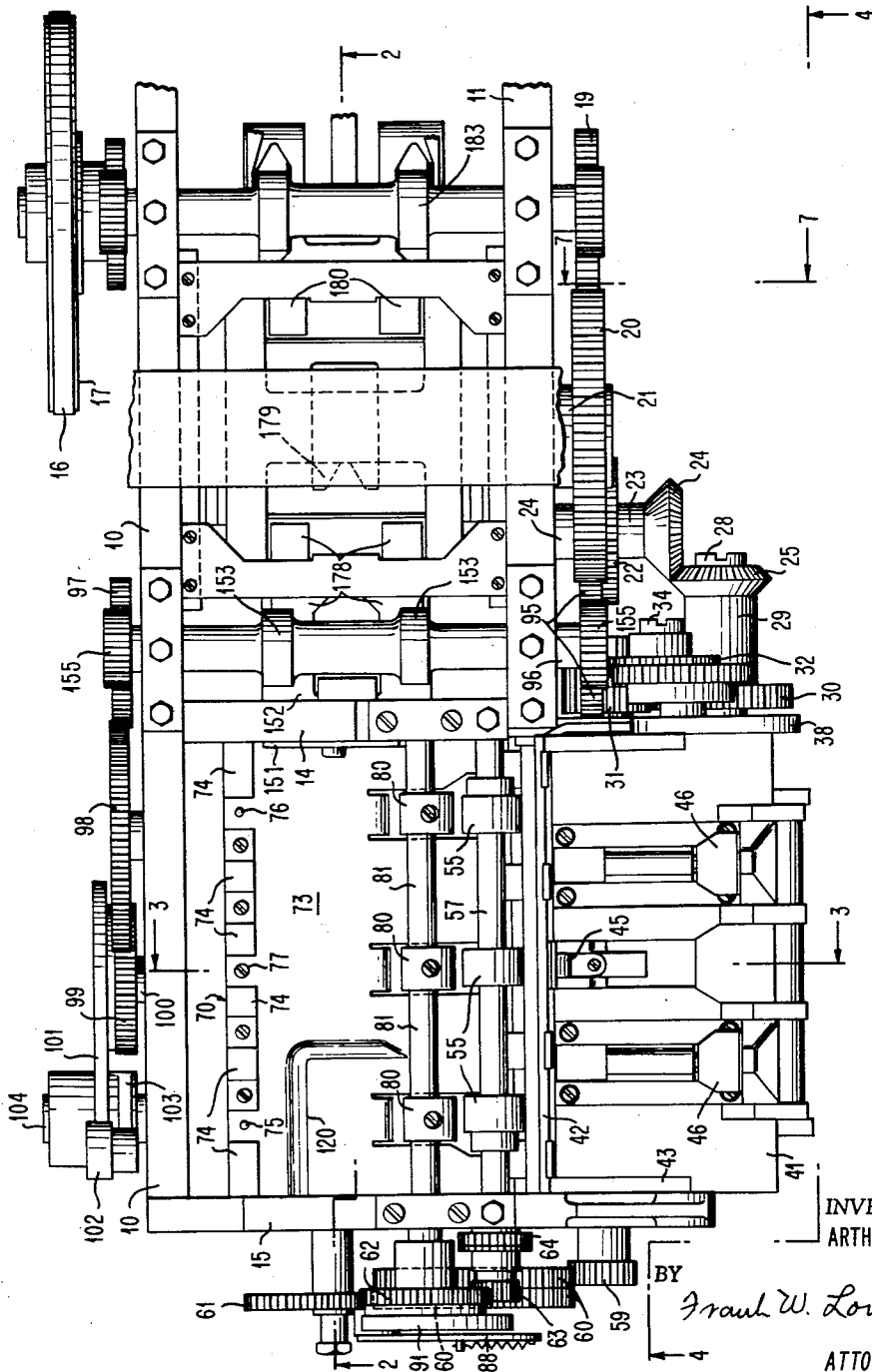


FIG. 1

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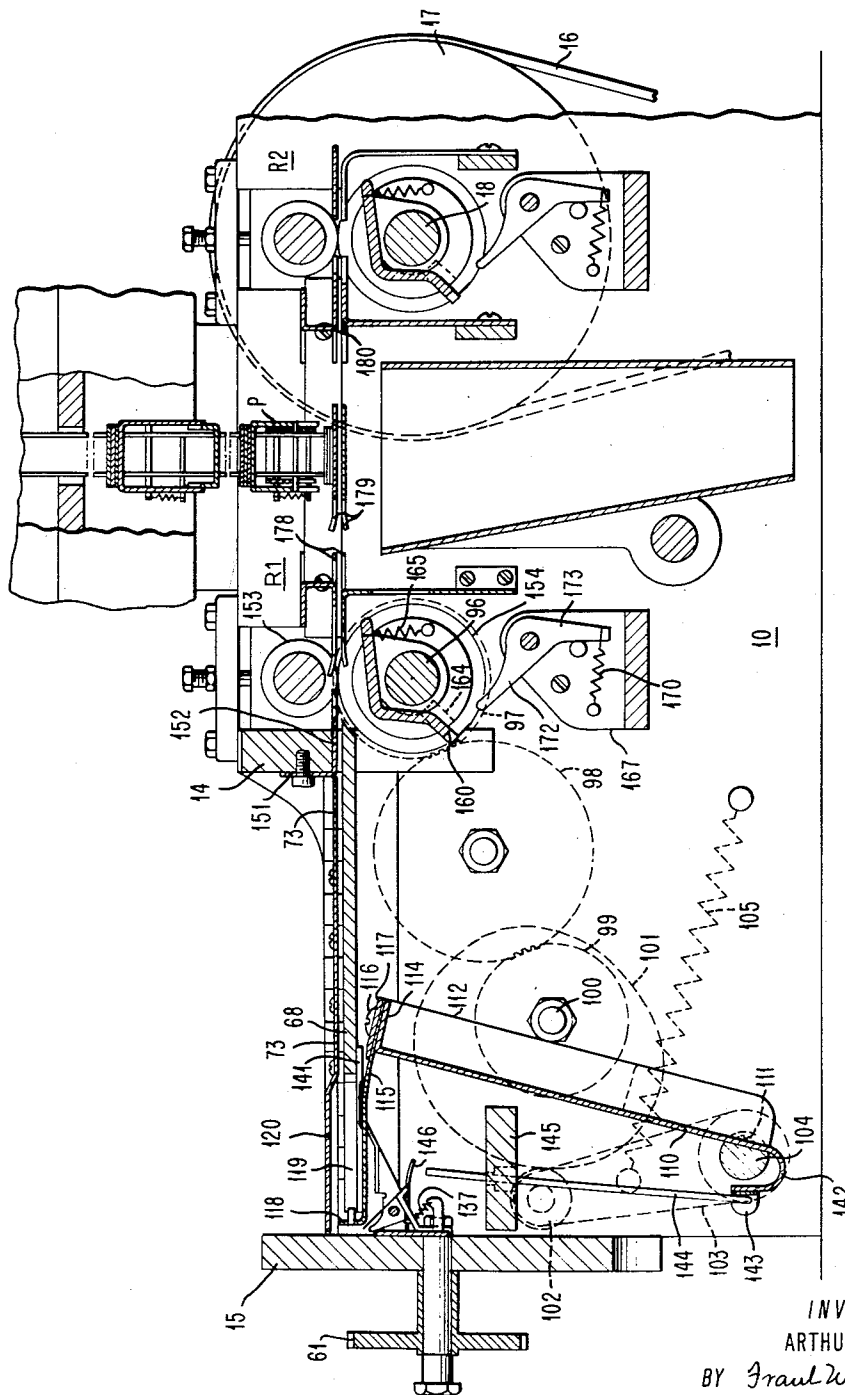


FIG. 2

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SHEET FEEDING AND REGISTERING MACHINES

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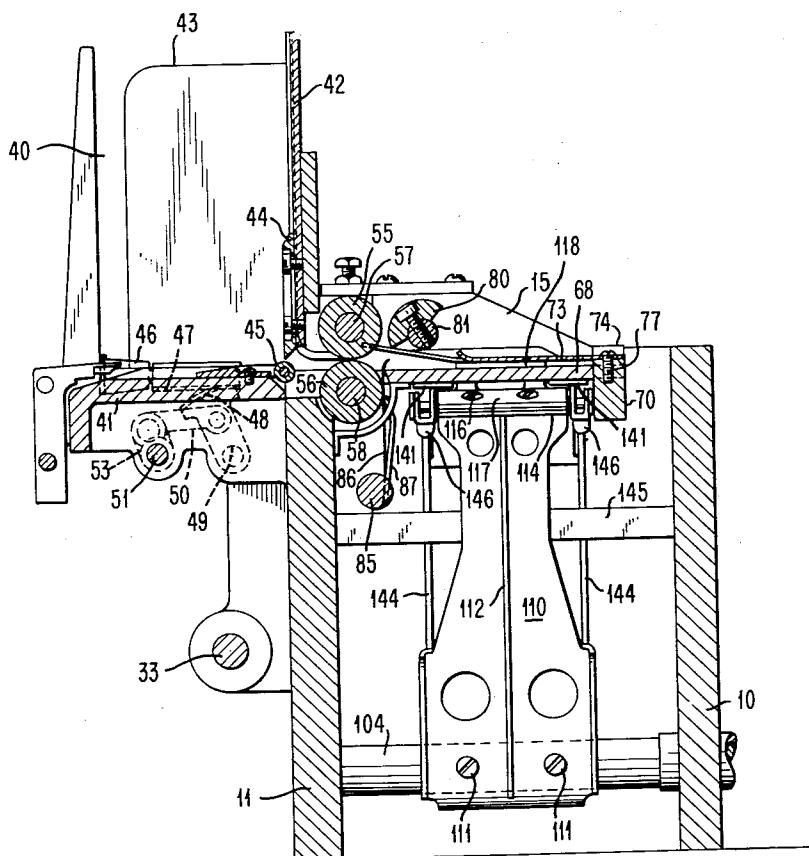


FIG. 3

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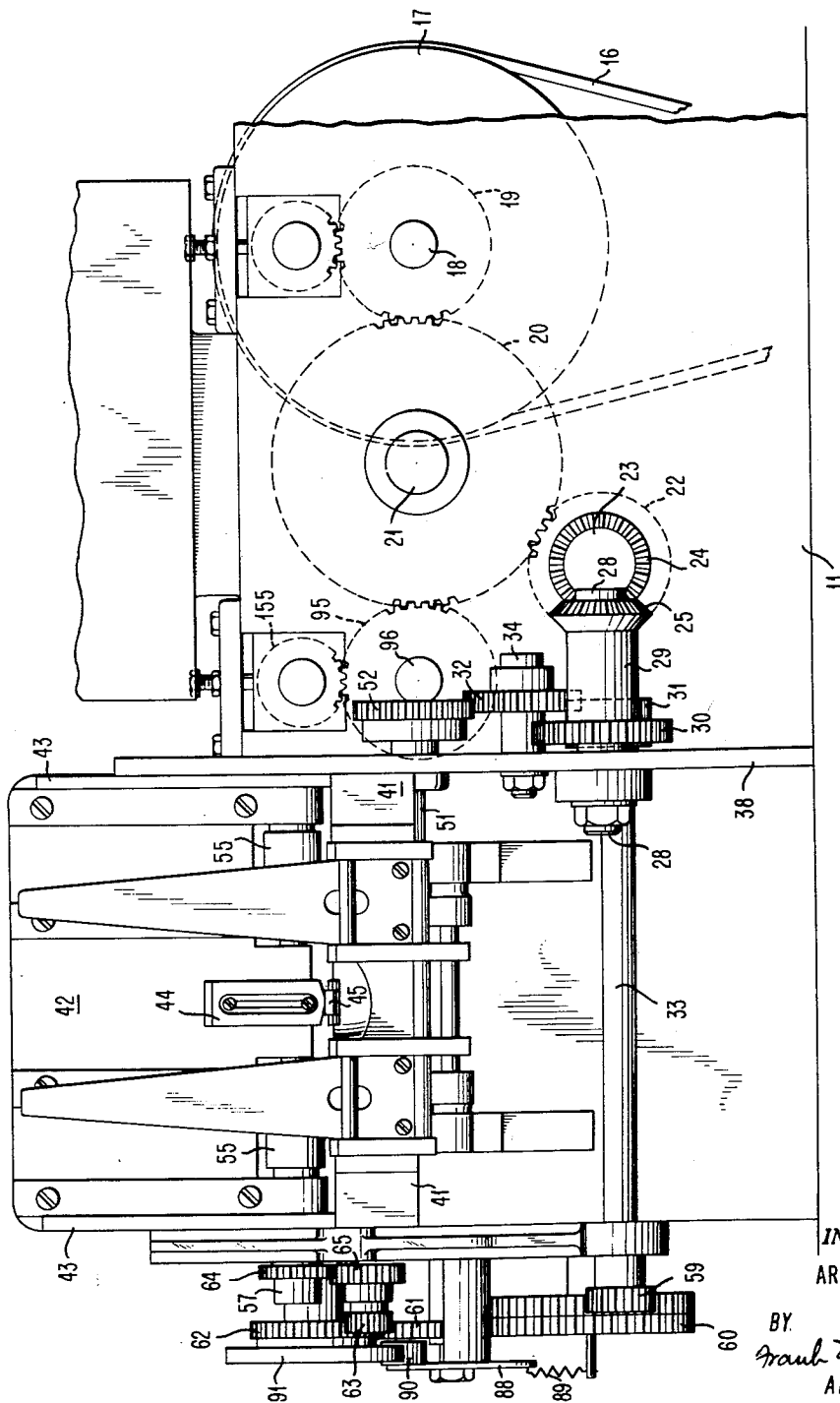
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SHEET FEEDING AND REGISTERING MACHINES

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7 Sheets-Sheet 4



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SHEET FEEDING AND REGISTERING MACHINES

Filed July 23, 1958

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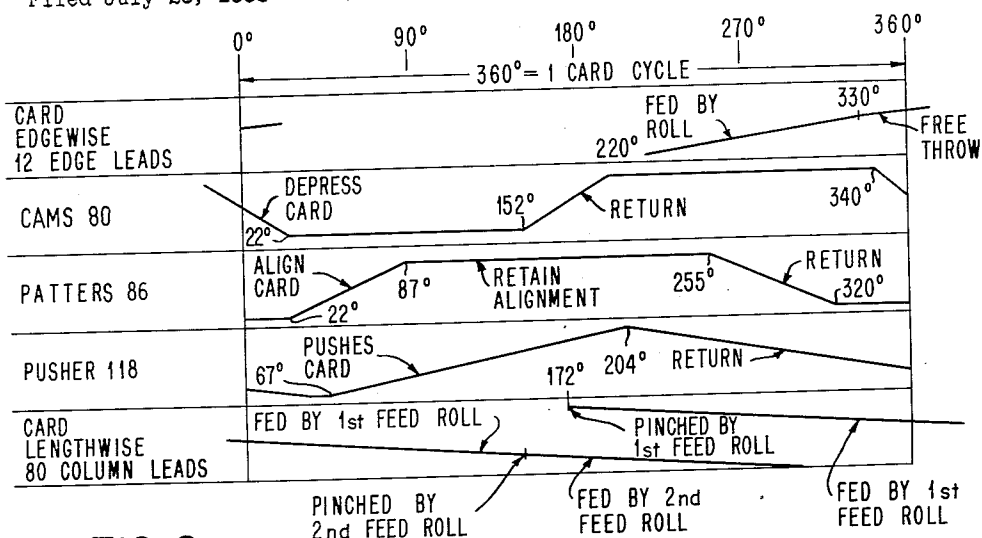


FIG. 6

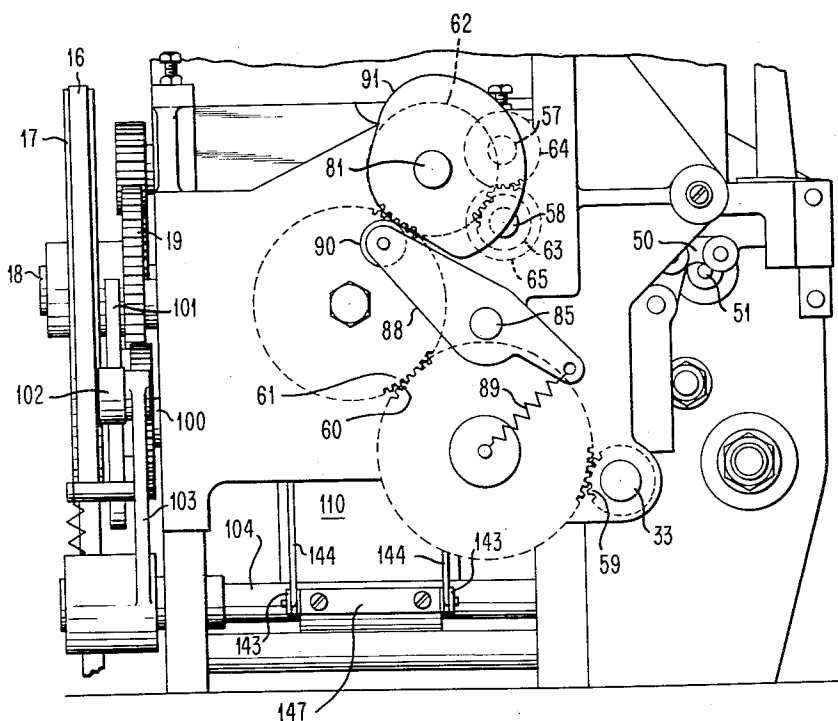


FIG. 5

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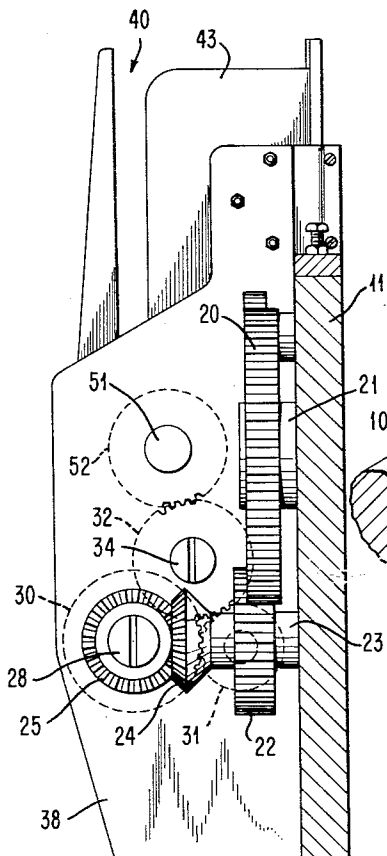
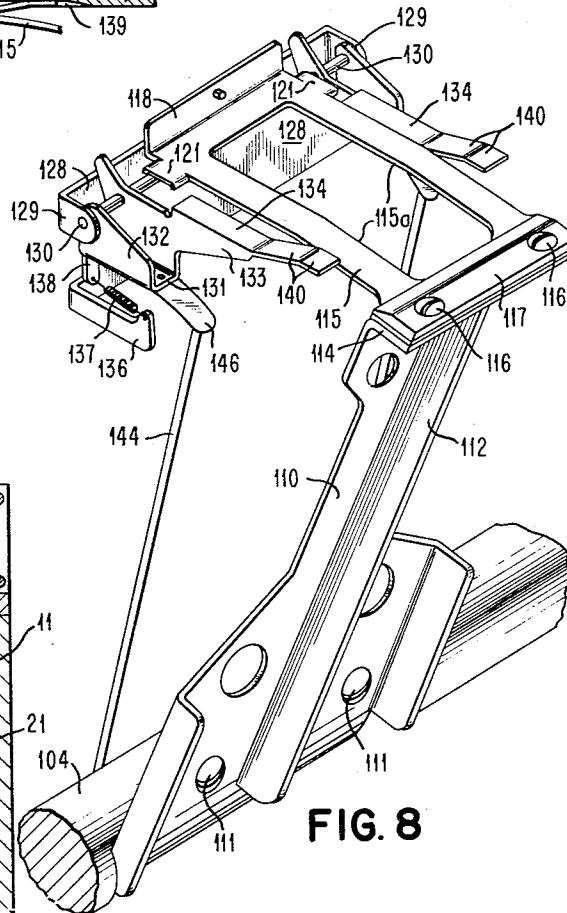
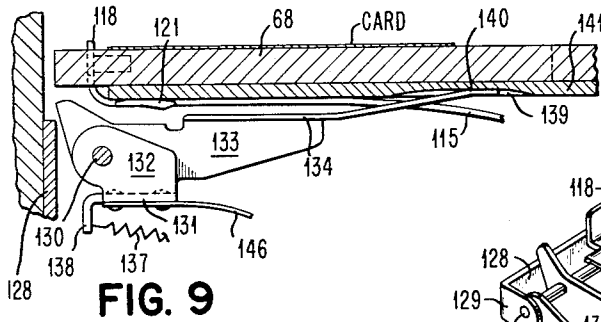
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SHEET FEEDING AND REGISTERING MACHINES

Filed July 23, 1958

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SHEET FEEDING AND REGISTERING MACHINES

Filed July 23, 1958

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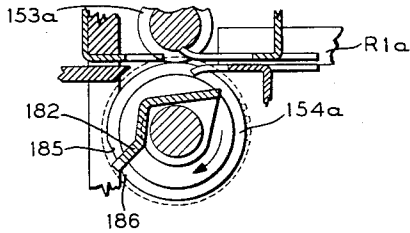


FIG. 12.

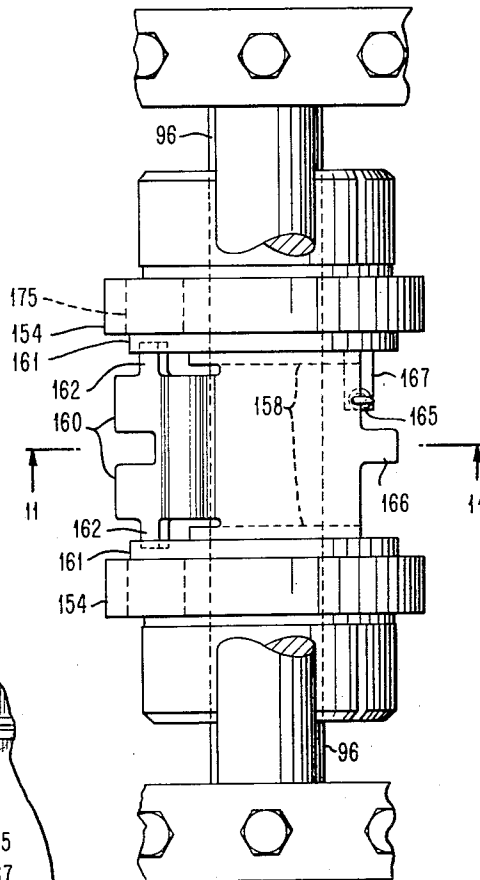
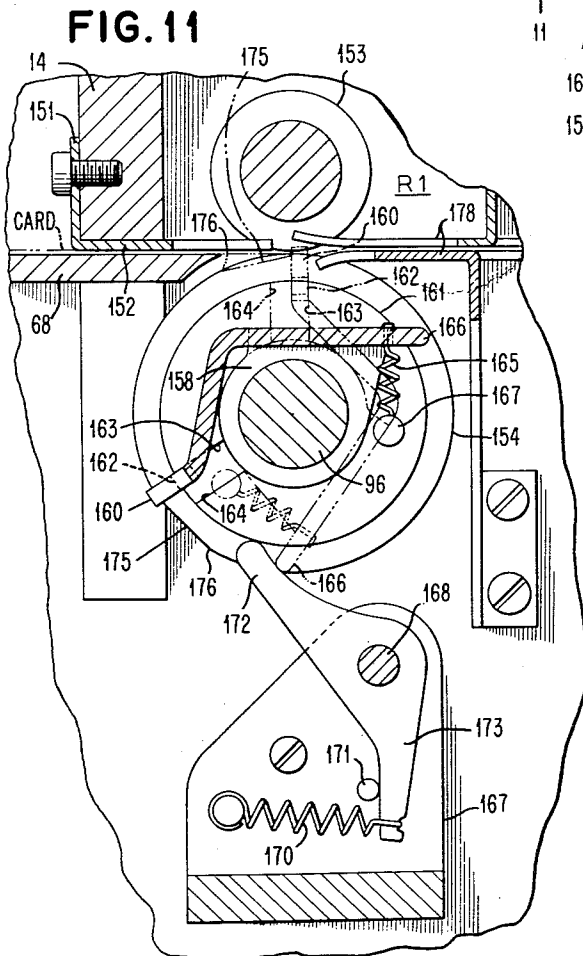


FIG. 10

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3,015,485

SHEET FEEDING AND REGISTERING MACHINES
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Filed July 23, 1958, Ser. No. 750,405
6 Claims. (Cl. 271-53)

This invention relates to card feeding machines and particularly to the type having card feeding and registering mechanisms for cards fed uninterruptedly through the machine, i.e. in continuous motion without stopping appreciably.

Card feeding and registering mechanisms have been devised for statistical machines or the like but in prior machines the feeding has been a start-stop cyclic operation which consumed so much time that a low card feed speed resulted. With the adoption of the present arrangement in which cards are fed through the machine in continuous motion and the registration is continuously maintained, card feed operations have been increased from the present rate of 150-200 cards per minute to 500-750.

By registration of cards is meant the re-aligning or re-positioning of cards which may have deviated from their true line of travel in their transit through the machine in order that when such cards arrive at the station where an operation is to be performed on the card, the deviation of each card from its true line of travel has been individually corrected to enable said operation to be effected on the successive cards at precisely identical locations. Card registrations are preferably effected for the two different sides of the cards, i.e. vertical and horizontal although in some machines the registration of only one side will be required.

The principal object of the present invention is to provide a card registration means for a card feeding mechanism of the type in which successive cards are fed in uninterrupted motion through the machine.

A still further object of the invention is to provide a card feeding mechanism of the type which first feeds the card in one direction and then at right angles to said direction, with a card registration means which serves in connection with the feeding of the card in each direction the alignment of the card, with the result that the card is aligned both vertically and horizontally.

A still further object of the present invention is to devise a card registration apparatus for a card feed roll system in which the feeding of a card is retained in a single plane, in contrast to card registration devices for sheet feeding drums of printing machines in which registration is effected by grippers or other mechanisms.

More specifically it is an object of the present invention to devise and locate at a common station receiving a card a card registration and feeding device which serves to feed and register a card in two dimensions.

In carrying out said last object in the present machine the ejecting feed rolls of the card feed hopper forcefully eject the card in one direction over a base to project the leading horizontal edge against an aligning bar, and to effectively accomplish this flexible "patters" resiliently urge said leading horizontal edge of the card against the aligning bar. A reciprocating card pusher operating beneath said base at the common station but having picker projecting through the base to engage a vertical card edge then feeds the card now aligned in one direction transverse to said direction to a pair of feed rollers, one of which carries an aligning gate. By having the pusher feed the card faster than said feed rollers, a buckling of the card between the movable pusher and said aligning gate forcibly moves the other edge of the card against said gate to align said card at its leading vertical edge

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preliminary to further feeding. Thereafter the feed rolls and rotating card feed gate are activated to feed the card to the station where the operation on the card is to be performed. Therefore, according to the present invention a common station serves to register a card in both dimensions, and in the accomplishment of this purpose concomitantly changes the card feed from an initial feed in one direction to a feed in a direction transverse thereto.

It is to be understood that while it is desirable that both of the registering devices be employed, certain registering requirements may be satisfied by the adoption of one or the other, and for this reason the showing herein of both should not be regarded as restrictive. While the present invention has been shown in connection with card feeding, it is evident that other elements may be fed, and the registering devices shown herein may be adapted for a variety of different types of machines.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In said drawings:

FIG. 1 is a plan view of the card feeding mechanism comprising the present invention, showing particularly the driving mechanism and the novel structural coordination of the two card feeding mechanisms for feeding the card in one direction and then at right angles thereto.

FIG. 2 is a longitudinal sectional view taken on the irregular section line 2-2 of FIG. 1.

FIG. 3 is a transverse sectional view taken on the line 3-3 of FIG. 1 showing in cross section the card hopper card feed and the card patter mechanism for aligning the card along its longitudinal edge prior to feeding the card longitudinally.

FIG. 4 is a view in side elevation of the card feeding apparatus taken on the irregular section line 4-4 of FIG. 1.

FIG. 5 is a view in end elevation of the left end of the card feeding apparatus.

FIG. 6 is a timing chart of the machine.

FIG. 7 is a view in side elevation taken on the line 7-7 of FIG. 1 showing in detail some of the gear drive.

FIG. 8 is a perspective view of the card pusher mechanism for feeding the card longitudinally.

FIG. 9 is a detail view showing the parts of the card pusher mechanism.

FIG. 10 is a plan view of one of the lower card feed rollers to show the card gate carried thereby for aligning the card along its leading vertical edge as it is fed longitudinally.

FIG. 11 is a sectional view taken on the line 11-11 of FIG. 10.

FIG. 12 is a sectional view of a modified form 1 of card gate.

CARD HOPPER AND CARD PICKER

To support and journal the shafts and the principal elements of the card feeding apparatus there are provided two main side frames 10 and 11 (see FIG. 1) resting upon a base plate, not shown. Strengthening of the frame is effected by an end frame plate at the right (not shown), an intermediate frame plate 14 and an end frame plate 15. Other elements not specifically described herein are provided for the purpose of strengthening and stiffening the frame.

A prime mover, such as an electrical motor, not shown, drives through a belt 16 (FIGS. 1, 2 and 4) a pulley 17 which is attached to a shaft 18 journaled in the side frames 10 and 11. Attached to said shaft 18 is a gear 19 and from this gear 19 there is a gear train drive to

the card hopper picker drive mechanism now to be described.

Gear 19 meshes with an idler gear 20 (see FIG. 4) mounted on a pivot stud 21 carried by the side frame plate 11 and said gear 20 meshes with a pinion 22 mounted on a pivot stud 23 (FIG. 1), likewise secured to the side frame 11. Sleeved to the pinion 22 is a beveled gear 24 meshing with a companion beveled gear 25 which latter is loosely mounted on a pivot stud 28. By means of a sleeve 29 beveled gear 25 is secured to a gear 30. As best shown in FIG. 7 the gear 30 meshes with an idler gear 31 which is sufficiently wide (see FIG. 4) to mesh with a second idler gear 32. The pivot stud 28 for gear 30 and beveled gear 25 and pivot stud 34 for gear 32 respectively are carried by the side frame 38 of the card feed hopper.

The above gear drive constitutes the interconnecting drive between the constantly rotating shaft 18 and a card picker mechanism which will now be described in detail.

The card picker is of the usual construction for feeding cards singly from a card hopper 40 (FIGS. 1 and 3) which rests principally upon a base plate 41. The card hopper includes an upstanding rear plate 42 and parallel side frame plates 43 to form a receptacle in which punched cards are deposited to rest on the base plate 41. The plate 42 carries an adjustable plate 44 (see also FIG. 4) which, with a roller 45 forms the card throat through which cards are fed widthwise with the 12 index point leading.

A pair of card pickers 46 (FIGS. 1 and 3) slidably reciprocates in respective guide slots in the base plate 41 and carry at their underside segment gear teeth 47 meshing with a related gear segment 48 pivoted on a stud 49. Each segment 48 has a link connection 50 connected to a respective crank arm 53 (see FIG. 5) secured to a transverse drive shaft 51.

It will be noted from FIG. 7 that a gear 52 secured to the shaft 51 meshes with the idler gear 32. The rotation of shaft 51 will, through the crank drive, reciprocate the card pickers 46 to feed the lowermost card through the card throat. It will be seen from FIG. 3 that the card feed hopper assembly 40 is at right angles to the main side frames 11 and 12 which diminishes the length of the card feed apparatus. However, as will be evident later on, the initial feeding of the card widthwise in one direction and at right angles to the subsequent feed in the other direction cooperates in the alignment of the card widthwise.

For the purpose of seizing and feeding the card as it issues widthwise from the card hopper 40 through the card throat, there is provided opposing card feed rollers 55 and 56 secured to respective shafts 57 and 58 (see FIG. 3), which are driven at a high speed rate so as to completely feed the card out of the card feed hopper to project the leading horizontal edge of the card against an aligning bar as will be described. These rollers are driven from the constantly operating mechanism by a drive from the shaft 33 (see FIG. 5). To this end there is secured to shaft 33 a gear 59 which, through gears 60, 61 and 62, rotates a pinion 63 secured to the lowermost feed roll drive shaft 58. A gear 65 (see FIG. 4) secured to lower feed roll shaft 58 meshes with a gear 64 secured to the upper feed roll drive shaft 57. The aforementioned card drive is principally mounted at the left-hand of the machine as best seen in FIGS. 1, 4 and 5.

In the cycle of operation of the machine the card picker initially feeds the card from the hopper at 140° and at 220° (see timing chart of FIG. 6) the leading edge is seized by the feed rollers 55 and 56. Said rollers continue to feed the card to 330° of the machine cycle, at which time there will be a "free throw" or motion of the card, due to its momentum against an aligning bar for aligning the card widthwise.

MEANS TO ALIGN CARD ON HORIZONTAL EDGE DURING FEEDING IN ONE DIRECTION

1. Aligning bar

The rapid rotation of the feed rollers 55—56 feeds the card to rest upon a registering plate 68 which is at a station known as the common aligning station since it embodies mechanisms which serve to align the card in two dimensions as it is fed in two directions.

The registering plate 68 is mounted (see FIGS. 2 and 3) between the intermediate side frames 14 to 15 and between the front side frame 11 and rear side frame 10 and its plane is beneath the bite of the feed rollers 55 and 56 (see FIG. 3) so that the card, as it is ejected by the feed rollers 55 and 56, drops downwardly to rest upon the registering plate. To insure that the card rests on the registering plate 68 there is mounted above said plate a baffle or cover plate 73. The baffle plate fully covers the registering plate 68 (see FIG. 1) and consists at its rear end of a flat plate secured to an aligning or registering bar 70. Aligning bar 70 is provided with a plurality of upstanding blocks 74 and carries aligning pins 75 and 76 fitting in the holes in the tabs of the cover or baffle plate 73. A screw 77 serves to attach the baffle plate 73 to the registering bar 70.

The portion of the aligning bar 70 which is above the top surface of the registering plate 68 serves as an abutment to stop and straighten out the card when its leading or horizontal edge is projected against the aligning bar 70 as it is fed in one direction. To insure that the card abuts the aligning bar to effect a positive horizontal edge alignment of the card spring patters 86 which will be subsequently described are employed for this purpose. However, before the spring patters are activated to positively align the card, the trailing edge of the card is deflected downwardly during the "free throw" of the card by three segment cams 80 (FIGS. 1 and 3) carried by a rotatable shaft 81 to depress the trailing edge so it is certain to be engaged by the patters. From FIG. 5 it will be seen that the constantly rotating gear 62 is secured to the shaft 81. The deflecting segment cams 80 are rotated during each cyclic operation of the machine.

From the timing diagram of FIG. 6 it will be seen that the segment cams 80 engage the trailing edge of the card about 340° and continue to depress the trailing edge of the card downwardly on the registering plate 68 until about 22° of the next cycle. The concentric periphery of the segment cams 80 is then active to continue to hold the card downwardly on the registering plate between 22° to 152° of the next cycle. During 22° to 87°, as shown in the timing chart of FIG. 6, card patters are effective to engage the trailing edge of the card to continue, if necessary, the rearward feed of the card by pushing the card until the leading edge strikes the registering bar 70 to straighten it out, if it is in a misaligned position.

2. Card patters

Journalled in the intermediate side frames 14 and 15 is a rock shaft 85 (FIG. 3) to which is attached a plurality of resilient spring card patters 86 which bear against a preloading plate 87 also secured to the rock shaft 85. These spring patters extend upwardly above plate 87 and reciprocate in slots in the registering plate 68 and are located between the feed rolls 56 in order that said patters may reciprocate forwardly and rearwardly without interference. The uppermost edge of each of the patters 86 is above the surface of the registering plate 68 and has a hooked-over portion to engage the trailing edge of a card.

Second to the extremity of shaft 85 outside of the end frame 15 (FIG. 5) is a follower arm 88 urged by a spring 89 to cause its follower roller 90 to bear against a cam 91 secured to the gear 62. In the cyclic operation of the

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machine the profile of the cam 91 rocks the shaft 85 to cause the card patters to be reciprocated.

Before the card is fed into registering and aligning position from the card hopper feed rolls, the card patters are returned to the left between 255°-320° (see FIG. 6) behind the periphery of the hopper feed rolls 56 so as not to interfere with the "free throw" feeding of the card on the registering plate 68. While the hopper feed rolls 55 and 56 are feeding the card, segment cams 80 are effective at 340° and to 152° of the next cycle to depress the trailing edge of the card on the registering plate 68. At 22° of said next cycle cam 91 rocks shaft 85 clockwise to move the patters to the right and by engaging the trailing edge of the card moving it by a resilient action until the leading edge of the card firmly strikes the registering bar 70 to align the card horizontally. The alignment is retained by the patters until 255° of the cycle. If by chance the card rebounds from the aligning bar 70 the circular portions of the cams 80 guide the trailing edge of the card and depress the card to the level of the patters. After the patters have served to assist in the longitudinal alignment of the card they are then returned to the left back of the lower hopper feed rolls 56 to repeat the operation for the following card. If for any reason the next card leaves the hopper prematurely, the radial edges of the cams 80 will keep the leading card edge momentarily elevated above the patters until the preceding card has been fed clear by the pusher.

LONGITUDINAL CARD FEED—CARD PUSHER

During the time (see timing chart of FIG. 6) the patters 86 resiliently hold the card against the aligning bar 70 in the aligned position and the card is held down by the segment cams 80, a card pusher is activated to feed the card longitudinally or lengthwise of the card. This longitudinal feed is from the left to the right as viewed in FIGS. 1 and 2 and is, therefore, at right angles to the initial feed of the card out of the card hopper.

The operating drive for said card pusher is best shown in FIGS. 1, 2 and 4. It will be seen from FIGS. 1 and 4 that gear 20 meshes with a gear 95 secured to one end of a lower feed roll drive shaft 96 which carries outside of the rear frame 10 a gear 97 (FIGS. 1 and 2). Gear 97 drives through an idler gear 98 a gear 99 secured to a stud shaft 100, both of which gears 98 and 99 are mounted outside of the rear frame 10, as shown in FIG. 1. Attached to gear 99 is a cam 101 against which bears a follower roller 102 carried by a follower arm 103 fixed to the card pusher rock shaft 104. A spring 105 is attached to the follower arm 103 in order that its roller 102 follows the contour of the operating cam 100 as it is rotated by the drive mechanism just described during the cyclic operation of the machine.

As best shown in FIGS. 2, 3 and 8, the reciprocable pusher comprises a U-shaped pusher arm 110 fitted in a flat of the rock shaft 104 and secured thereto by screws 111. A central rib plate 112 midwise of the pusher arm 110 stiffens the pusher arm to provide a rigid and unyielding pusher arm 110. The upper end of the arm is overturned to form a support extension 114. A card pusher plate 115 is fitted over said extension and by screws 116 which pass through a top plate 117 and into the extension 114, the card pusher plate is carried by the arm 110.

The card pusher plate 115 has a central opening 115a (see FIG. 8) and is resiliently biased to cause the free end to rise upwardly whereby a card pusher projection 118 projects through the aligned aperture 119 (FIG. 2) in the registering plate 68 and during the feeding of the card is above its top surface to cause said pusher projection 118 to engage the left edge of the card. The projection 118 is below a canopy 120 (FIGS. 1 and 2) which is merely a raised or elevated portion of the cover plate 73. The card pusher plate has a pair of ears 121, the

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function of which will be explained. The left-hand position of the card pusher projection 118, as shown in FIG. 2, permits the feeding of the card transversely out of the card hopper on the registering plate 68 without interference.

At the beginning of the cyclic operation of the machine card pusher projection 118 is at the left, as shown in FIG. 2, and as the shaft 104 is rocked clockwise under control of the cam 101 the card pusher projection 118 will reach the vertical edge of the card at 67°. Further movement of the card pusher projection to 204° of the cycle (see FIG. 6) then feeds the card to the right while the card patters 86 are resiliently holding the card in aligned position.

At the extreme right-hand stroke of the pusher arm 110 the card pusher projection 118 is moved downwardly by a switching mechanism to permit its return without interference with the card.

Secured to the end frame plate 15 is a bracket plate 128 (see FIG. 8) having ears 129 which support a rod 130. On said rod is pivoted a pair of switching devices which are formed with a bail portion 131 and side plates 132 and 133. Each side plate 133 has a straight guide track 134 normally below the respective ear 121 (see FIG. 9) and an uprising switch cam track 140. The bracket plate 128 is also formed with extensions 136. To the end of each extension a spring 137 is anchored, the other end being attached to a depending projection 138 of the respective switching device. The resiliency of the spring 137 causes each switching device to be rocked counterclockwise about the rod 130 and positions the end of a cam track 140 to fit in a well 139 of a related runner plate 141. The pair of runner plates 141 are secured underneath the registering plate 68 (see FIG. 9).

As the card pusher 118 moves to the right each ear 121 will slide under the respective runner plate 141 and over the straight track 134 and ultimately strike the cam track 140 and move between the cam track 140 and the runner plate 141 to rock the switching device clockwise against the action of the spring 137. At the extreme position the ear 121 will pass off the end of the cam track 140 and the cam track 140 will be rocked by spring 137 to again occupy the well 139 of the runner plate 141. In coming back the pusher ears 121 strike the tapered end of the cam track 140 and are cammed downwardly to pass below the cam track 140, causing pusher projection 118 to be moved downwardly simultaneously beneath the top surface of the registering plate. Thus, the switching devices cause the right-hand movement of the card pusher 118 in an upper plane to feed the card and upon the left-hand movement of the card pusher 118 to be moved in a lower plane. This lowered position allows another card to be fed from the card hopper on registering plate 68 without interference by the pusher projection 118. The pusher continues to go backward with the ears 121 under the straight tracks 134 until said ears clear the track 134 and the inherent resiliency of the card picker plate 115 again restores the card pusher projection 118 to its upward position above the surface of the registering plate 68 to repeat the card pusher operation.

Any suitable cushioning devices (not shown) may be employed to soften the movement of the card pusher plate 115 when the ear 121 passes off the straight track plate 134.

It is also desirable to assist the action of the spring 137 to positively restore the related switching device to the position where the cam track 140 occupies the well 139 of the runner plate 141. To this end the lower part of the pusher arm 110 is provided with a curved portion 142 (see FIG. 2). Each end of the curved portion has integral ears 143 through which a related wire 144 passes. Side portions of a bracket 147 hold the wires in place (see FIG. 5). Each wire 144 passes through a hole in a tie bar 145. The upper end of each wire 144 is underneath a flexible extension 146 (see FIG. 8) which is fastened

underneath the bail portion 131 of the related switching device.

When the shaft 104 is rocked clockwise to cause the card pusher to feed the card the upper end of the thrust wire 144 will engage the respective spring projection 146, positively rocking the respective switching device counter-clockwise, thus assisting the operation of the spring 137. This is in the nature of a safety device for the switching devices and by safety devices the pair of switching devices are positively brought to the correct position to insure the upward position of the pusher projection 118 during the feeding stroke, and in the lower plane during the return stroke.

FURTHER LONGITUDINAL CARD FEED AND MEANS TO ALIGN CARD ON VERTICAL EDGE

As the leading edge of the card is moved to the right by the card pusher projection 118 it passes between the cover plate 73 and registering plate 68 (FIG. 2). A bracket plate 151 which is secured to tie bar 14 has a horizontal guide plate 152 with an attached spring finger (see also FIG. 11) in the same plane as the cover plate 73 so as to continue to guide the leading edge of the card until ultimately the leading vertical edge of the card enters the bite of upper and lower feed rollers 153 and 154, respectively, which are part of the first registering station R1. A pair of gears 155 (FIGS. 1 and 4) which are secured to the upper feed roll shaft mesh with respective gears 95 and 97 to drive the upper feed rollers 153, whereas the cooperating lower feed rollers 154 are secured to the drive shaft 96 (FIG. 2).

The card pusher proceeds to push the card for 105°, increasing the speed of card feed to the same rate and beyond the rate that the card is fed by the rotation of the upper and lower feed rollers 153, 154, respectively. At 172° (see FIG. 6) the leading edge of the card is pinched by said feeding rollers so as to be subsequently fed thereby and these feeding rollers not only direct the card to the operating station, such as a punching mechanism P (FIG. 2) but also align the card on its leading vertical edge by mechanism now to be described with particular reference to FIGS. 2, 10 and 11.

The lower feed rollers 154 carry a card gate 160 which functions while the movement of the gate is retarded to accurately measure the distance from the leading edge of the card that the card will be pinched by the trailing edge of a flat formed on the periphery of the lower feed rollers. The excessive feeding of the card by the card pusher will cause the card to buckle slightly to project the leading vertical edge of the card against the straight edge of the gate and said gate thereby acts as a ruler to align the vertical edge of the card. The seizing of the card at the same marginal distance insures the like start of each card to arrive at the desired operating or punching mechanism P at the same place to punch a card at identical index positions.

As best shown in FIGS. 10 and 11, the card gate 160 is mounted between the pair of lower feeding rollers 154 and is the cross member of a bail having two side plates 158 loosely pivoted on the drive shaft 96 of the lower feed rollers. The card gate 160 initially rotates with the feed rollers 154 but at a certain time is stopped to cause an independent rotation of the rollers 154 for a reason to be presently explained.

Attached to one side of each feed roller 154 is a disk 161 and each side plate 158 of the bail carries a lateral projection 162 fitting in a slot of the respective disk 161. Said slot has a stop edge 163 and an operating edge 164. Extending between the cross member of the bail and a stud 167 carried by one of the disks 161 is a spring 165 which normally urges each lateral projection 162 against the related stop edge 163. The cross member of said bail has an integral tail 166 (FIGS. 10 and 11).

Pivoted on a stud 168 carried by a bracket 167 is a double stop arm, the lower arm 173 of which is urged

by a spring 170 against the stop pin 171 to cause the upper arm 172 to be in the path of the tail 166 of the gate. Spring 165 is relatively lighter than the spring 170.

Each of the lower feed rollers has a tangential cut or flat 175 (FIG. 11) across the periphery, the terminal edge 176 being the pinching edge since it cooperates with the periphery of the upper feed roller to pinch the card between the edge 176 and the upper feed roller 153 after said card has been accurately positioned against the gate a predetermined distance from the edge 176 of the flat.

During the idle movement of the card pusher and the card feed by the pusher, feed rollers 154 are continually rotating to position the card gate 160 ahead (to the right) of the leading edge of the card. The flat 175 on the lower feed rollers is thus moved to a position to allow free entry of the card into the space or recess formed by the flat 175 and the upper feed rollers 153, as the leading edge of the card, which is still under control of the card pusher, is fed between the upper and lower feed rollers. During this time each lateral projection 162 of the card gate 160 rests against the stop edge 163 and the card gate continues to be held by spring 165 in this position ahead of the leading edge of the card (see dotted line position of FIG. 11). Upon further rotation of the lower card feed rollers 154 the tail 166 strikes the arm 172 and in view of the strong spring 170 the card gate is held during the independent feed of the lower feed rollers 154 until the operating edge 164 strikes the lateral projection 162 of the card gate 160. At this time, the card gate 160 is stopped at the feed roll center line. The leading edge of the card is $\frac{1}{2}$ " ahead of the pinching edge 176 and will contact the card gate approximately $\frac{1}{4}$ " before the operating edge 164 engages the lateral projection 162 of the card gate 160, producing a very slight buckle in the card. This causes the leading or vertical edge of the card to be forcibly moved against the card gate to straighten its leading vertical edge.

The distance between the edges 163 and 164 of the slot in each disk 161 will be great enough to allow for retarding the card gate 160 after contact of the tail 166 with the stop arm 172. The later release of the card gate 160 caused by contact with operating edge 164 will be delayed until after the card is pinched by the pinching edge 176 of the flat 175.

Following the pinching of the card at a predetermined distance from the leading edge, the card is now completely under control of the feed rollers 153 and 154. Continued rotation of the feed rollers 154 causes, by contact of the operating edges 164 with projections 162 the tail 166 to engage arm 172 to rock the double arm 172, 173 counter-clockwise about the stud 168, stretching spring 170 until tail 166 clears the stop arm 172, at which time the spring 165 causes the gate to return to the normal position preparatory to the registering or alignment of the following card.

If so desired, an adjusting means may be provided for the double arm 172, 173 to cause it to be effective at the proper time, thus varying the distance that the card gate measures the card. By obvious means the lower feed rollers 154 may be adjusted on the drive shaft 96 to regulate the time of action of pinching edge 176 of the flat 175 on the lower feed rollers 154.

As the card is fed by the feeding rollers 153, 154 it is guided by guide plates 178 and 179 to present each card to the punching station P, and thereafter is further guided by guide plates 180 (FIG. 2) to a second registering station R2 identical in construction to the first one previously described.

In the construction illustrated in FIGS. 1 to 11 the card gates at the two registering stations R1 and R2 are assumed to have identical constructions. Actually it is possible to simplify the construction of the first card gate in view of the fact the card pusher 118 can be operated in such a fashion that there is no need for retarding the

first card gate. FIG. 12 illustrates a modified card gate construction employing a non-yielding card gate 182 which is secured to the lower feed rollers 154a at the first card registering station R1a so that the gate 182 rotates with the rollers 154a at all times. The flat 185 on each roller 154a has a trailing edge 186 which is positioned only a slight distance (e.g., $\frac{1}{32}$ ") behind the card gate 182. The pusher 118 (FIG. 2) is so timed that the leading edge of the card enters the space between the gate 182 and the pinching edge 186 of the flat 185, FIG. 12, just as the gate 182 attains its vertical position, and the card is buckled slightly to ensure proper registry of its leading edge against the gate 182 before it is pinched by the edge 186. The outer end of the gate 182 rotates clear of the card path just as the card is pinched by the lower feed rollers 154a or only a slight instant later. In all other respects the operation of the feeding means is the same as that described hereinabove in connection with the embodiment shown in FIGS. 1 to 11.

While there have been shown and described and pointed out the fundamental novel features of the invention, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In combination with an upper feed roller, a lower feed roller adapted to cooperate with the upper feed roller, means to feed a sheet to said rollers, a sheet aligning device comprising a gate disposed above the periphery of said lower feed roller carried by said lower feed roller, resilient support means for the gate to enable either a synchronous rotation of said lower feed roller and said gate or an independent rotation of the lower feed roller while said gate is stationary and adapted to be engaged by the leading edge of a sheet fed by said sheet feeding means to straighten and align said leading edge, means for causing said gate to remain stationary during the independent rotation of said lower feed roller and the alignment of said sheet, and means comprising a terminal peripheral portion of a recess axially across the lower feed roller and cooperating with said upper feed roller for seizing said sheet at a predetermined distance from said leading edge to cause further feeding of said sheet after the aligning operation.

2. The combination of a lower feed roller having a terminal edge of a recess, an upper feed roller cooperating with said lower feed roller, means to feed a sheet to said feed rollers, a sheet aligning device comprising a gate pivoted on the axis of said lower feed roller and having a sheet stop portion disposed above the periphery of said lower feed roller, a stop resiliently pivoted below said lower feed roller, resilient means connected to said gate and said lower roller to rotate said gate against said stop to permit said gate to rotate synchronously with said lower feed roller and to permit an independent rotation of the feed rollers while said gate is held stationary, the stop causing said gate to remain stationary during the independent rotation of said lower feed roller and the feeding of the sheet to cause the sheet stop portion of said gate to be engaged by the leading edge of a sheet fed by said sheet feeding means to align said leading edge, further rotation of said lower feed roller causing the terminal edge of said recess of the lower feed roller to cooperate with said upper feed roller for seizing said sheet to cause further feeding of said sheet after the aligning operation.

3. In a sheet feeding and aligning mechanism, the combination of an upper feed roller, a cooperating lower feed roller, said lower feed roller having a recess across its periphery, a gate rotatable with said lower feed roller, means for feeding a sheet to said feed rollers, means for

imparting movement to said sheet feeding means to feed a sheet to said feed rollers and to continue to feed said sheet between said recess and said upper feed roller against said gate while said gate is being held to form a buckle in the sheet to align the leading edge of the sheet contacting said gate, means for rotating said lower feed roller and said gate to position said gate ahead of said sheet, and resilient stop means for temporarily holding said gate stationary while the lower feed roll continues to rotate so that the gate can buckle and align the sheet.

4. In a sheet feeding and aligning mechanism, the combination of an upper feed roller, a cooperating lower feed roller, said lower feed roller having a peripheral recess terminated by a sheet engaging edge which cooperates with the upper feed roller to further feed the sheet after an aligning operation, a gate rotatable simultaneously with said lower feed roller, means for mounting said gate on the axis of said lower feed roller, means to permit independent rotation of said lower feed roller while the gate is being held, means for feeding a sheet to said feed rollers, means for imparting movement to said sheet feeding means to feed a sheet to said feed rollers and to continue to feed said sheet in said recess against said gate while said gate is being held to form a buckle in the sheet to align the edge of the sheet contacting said gate, means for simultaneously rotating said lower feed roller and said gate to position said gate ahead of said sheet, and means for holding said gate during the sheet buckling operation during the independent feed of said lower feed roller until said sheet engaging edge in cooperation with said upper feed roller causes said further sheet feeding operation.

5. In a sheet feeding and aligning mechanism, the combination of an upper feed roller, a cooperating lower feed roller, said lower feed roller having a peripheral recess terminated by a sheet engaging edge which cooperates with the upper feed roller to further feed the sheet after an aligning operation, a gate rotatable with said lower feed roller, means for mounting said gate on the axis of said lower feed roller, means to cause the simultaneous rotation of said lower feed roller and gate and to permit independent rotation of said lower feed roller while the gate is being held, means for feeding a sheet to said feed rollers, means for imparting movement to said sheet feeding means to feed a sheet to said feed rollers and to continue to feed said sheet in said recess against said gate while said gate is being held to form a buckle in the sheet to align the edge of the sheet contacting said gate, means for simultaneously rotating said lower feed roller and said gate to position said gate ahead of said sheet, means for holding said gate at a predetermined position during the sheet buckling operation during the independent feed of said lower feed roller until said sheet engaging edge in cooperation with said upper feed roller causes said further sheet feeding operation, means rotatable with said lower feed roller for positively moving said gate away from said predetermined position.

6. The combination, with two cooperating rolls and feed means to feed sheets successively into said rolls, of a sheet aligning device comprising gate means projecting beyond the periphery of one of said rolls and engageable by the leading edge of each sheet to align such leading edge, means yieldably urging the gate means to a predetermined rotative position relative to said one roll such that said gate means and one roll will normally be rotated in unison, means for holding said gate means stationary against the resistance of said yieldable means during such aligning operation, one of said rolls having a recess in a part of its periphery to prevent feeding of said sheet by said rolls during the aligning operation, the portion of the recessed roll adjacent said recess being rotated into contact with a sheet at a predetermined distance from its leading edge following such aligning operation to cause

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such sheet to be pinched between and driven by and beyond said rolls.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,015,485

January 2, 1962

Arthur F. Smith

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

Column 4, line 72, for "Second" read -- Secured --;
column 12, list of references cited, under the heading
"UNITED STATES PATENTS" add the following:

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Signed and sealed this 30th day of October 1962.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents