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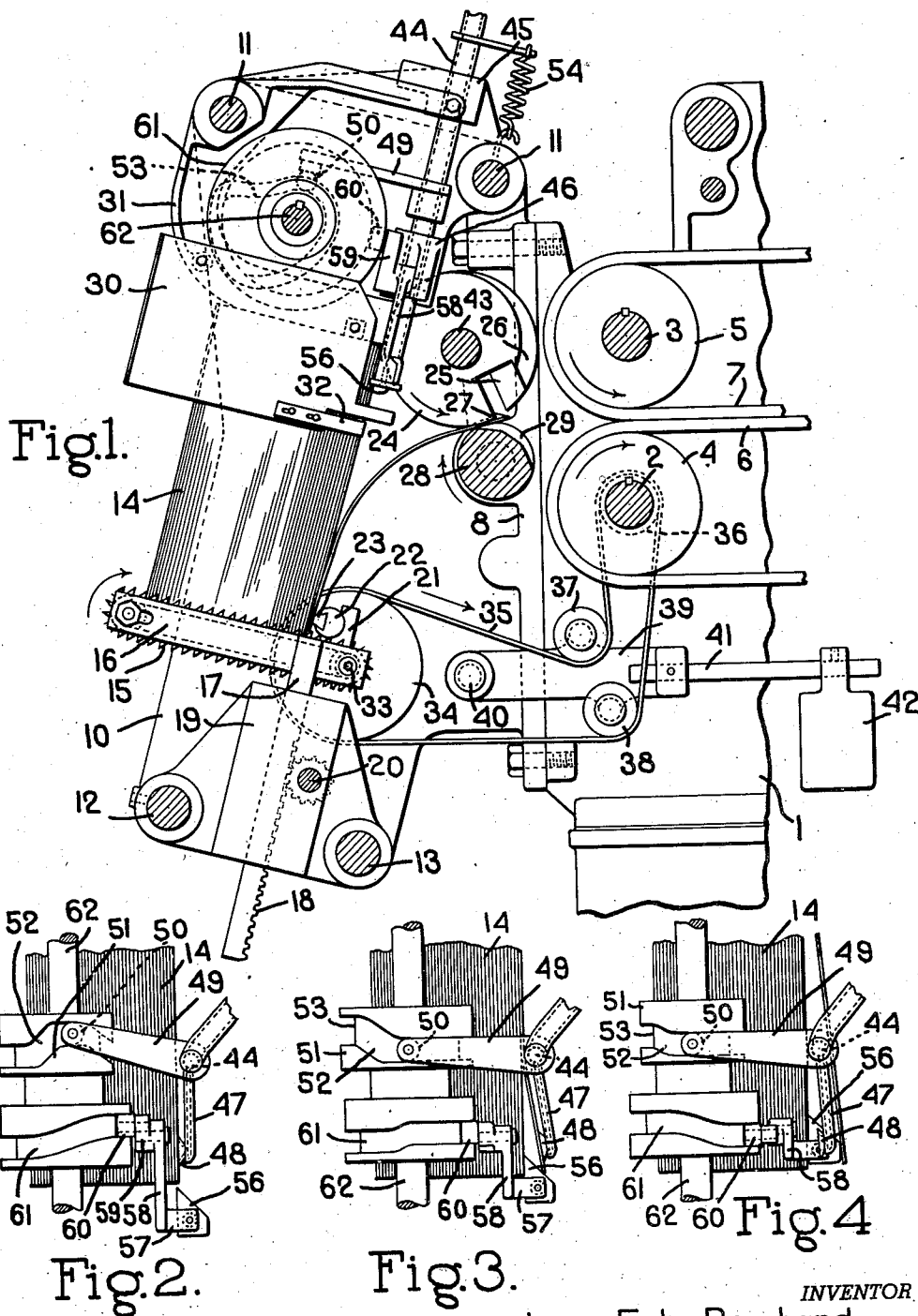
L. E. LA BOMBARD

2,369,914

SHEET FEEDING MECHANISM

Filed Aug. 26, 1942

5 Sheets-Sheet 1



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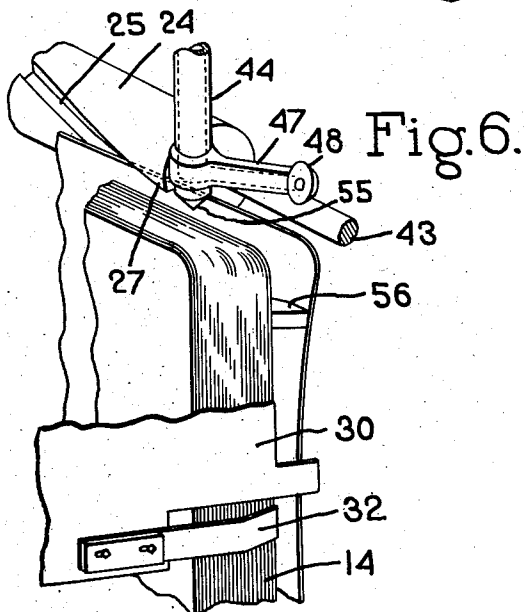
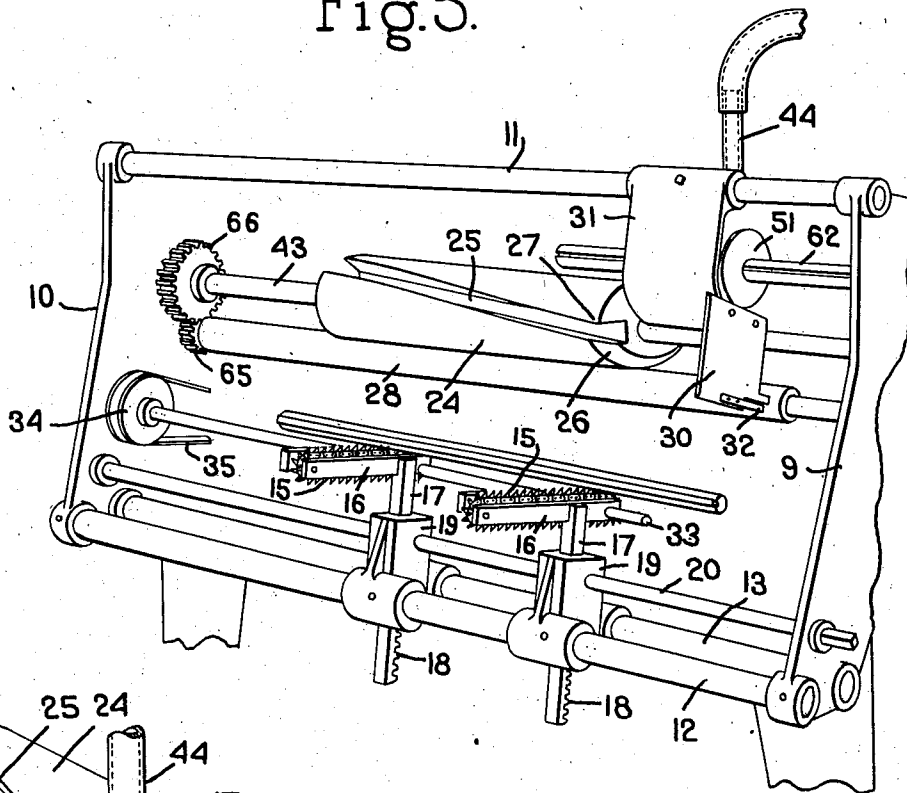
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5 Sheets-Sheet 2

Fig. 5.



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5 Sheets-Sheet 3

Fig. 7.

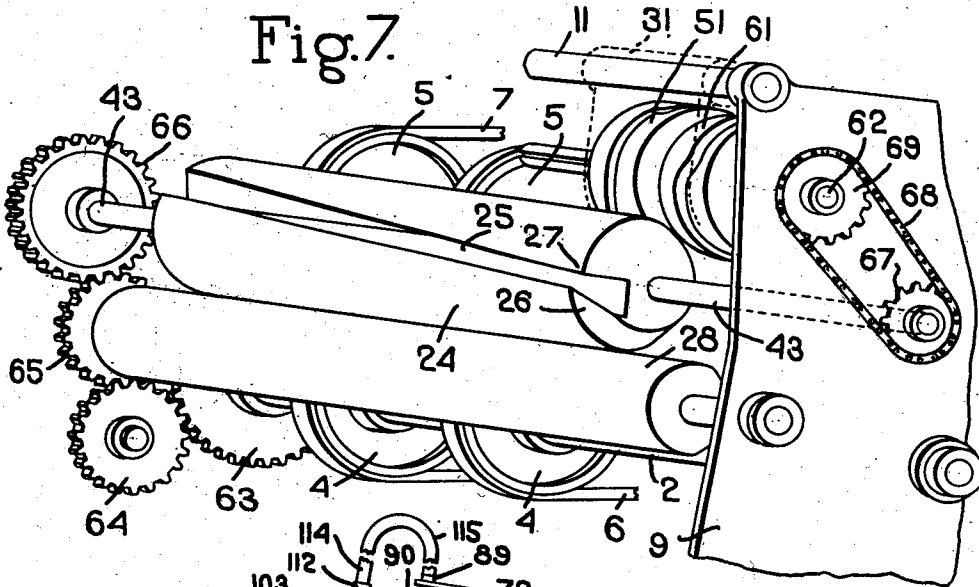
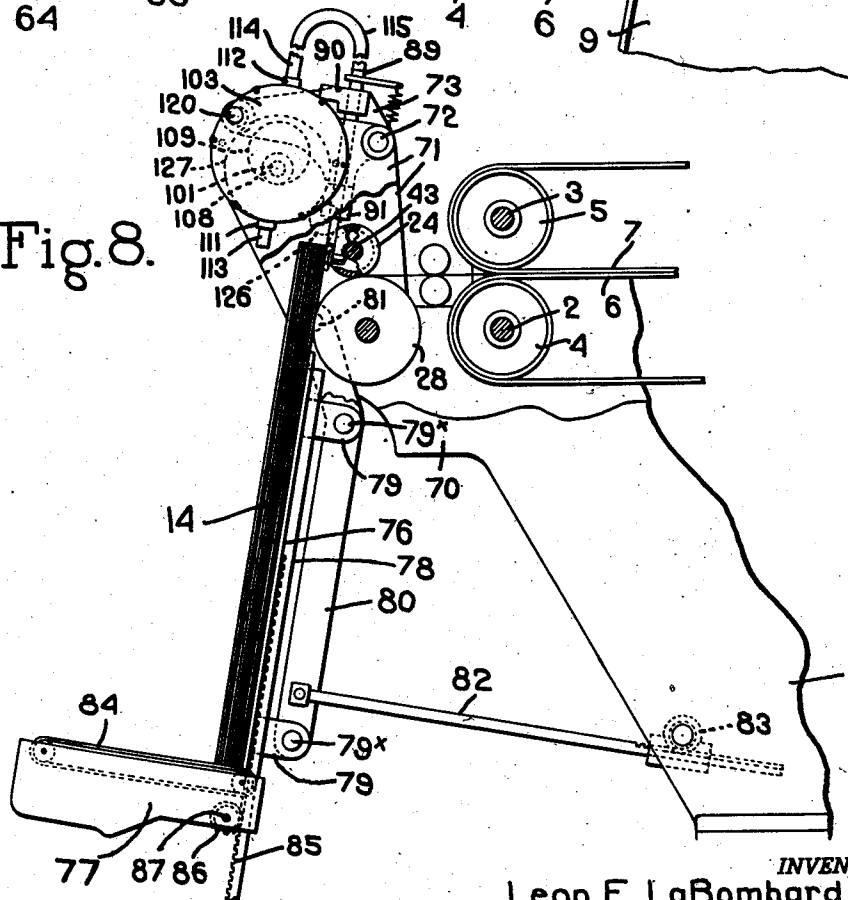


Fig. 8.



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5 Sheets-Sheet 4

Fig. 9.

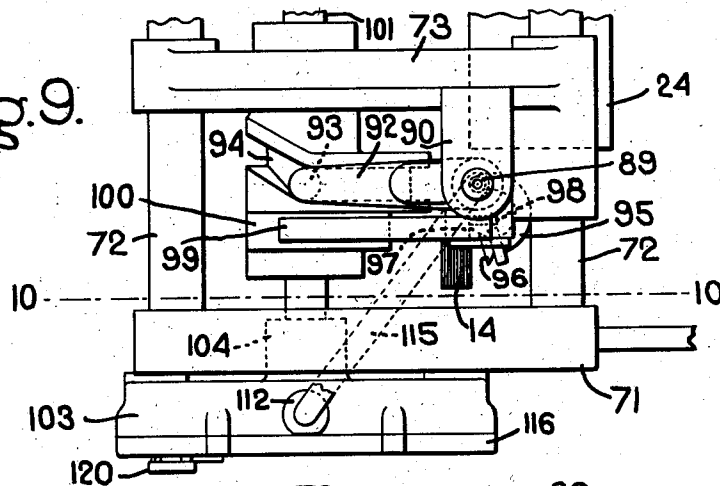


Fig. 10.

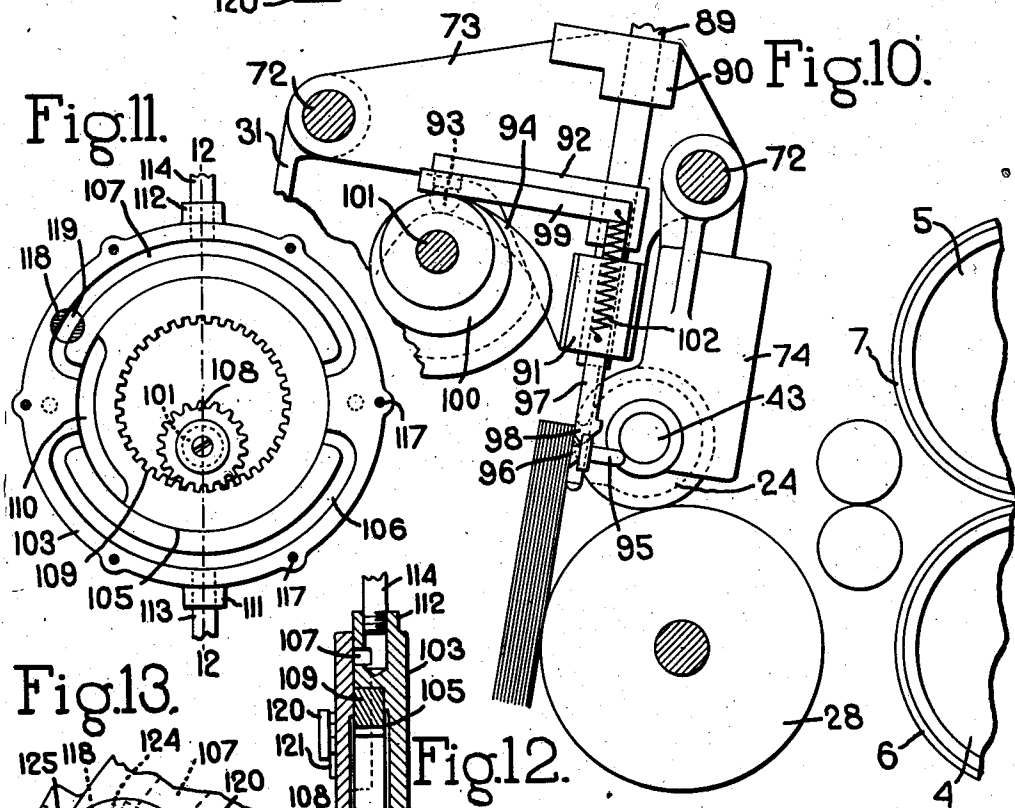


Fig. 11.

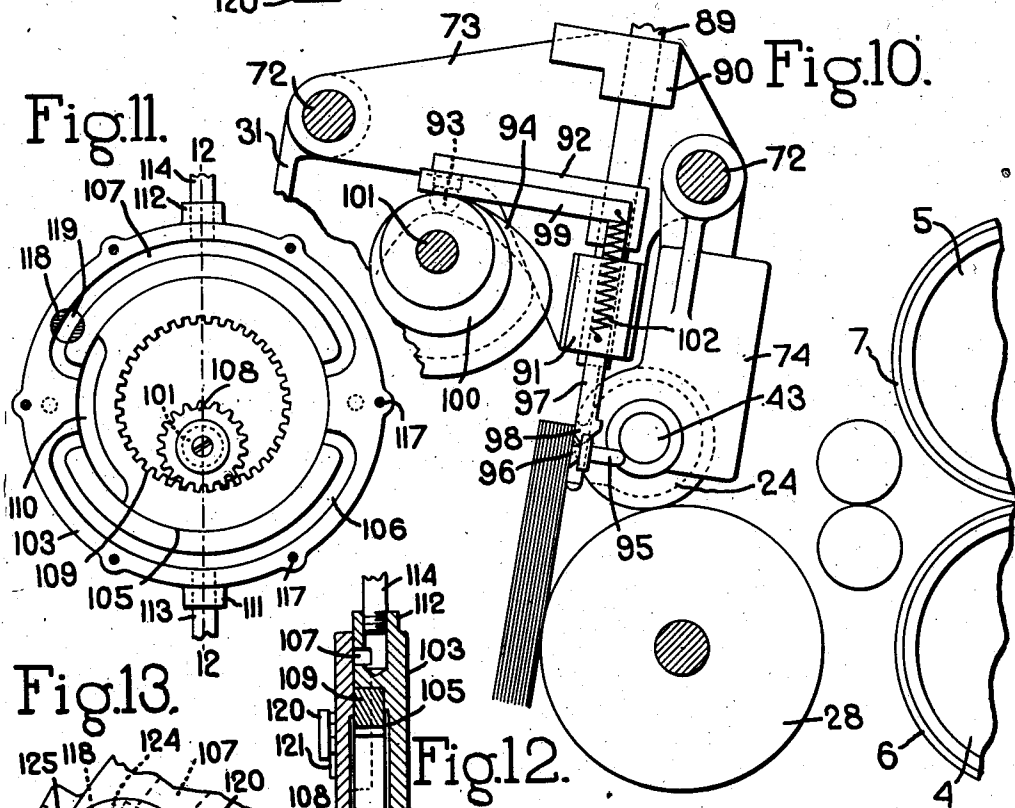


Fig. 13.

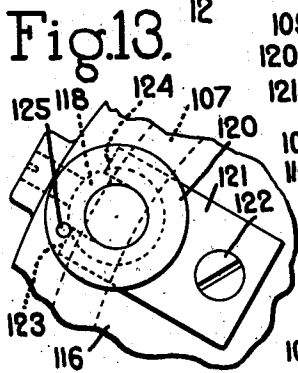
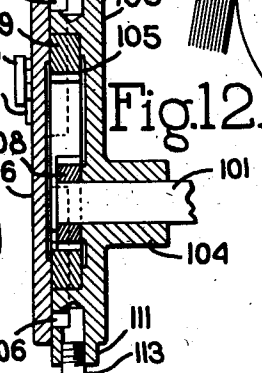


Fig. 12.



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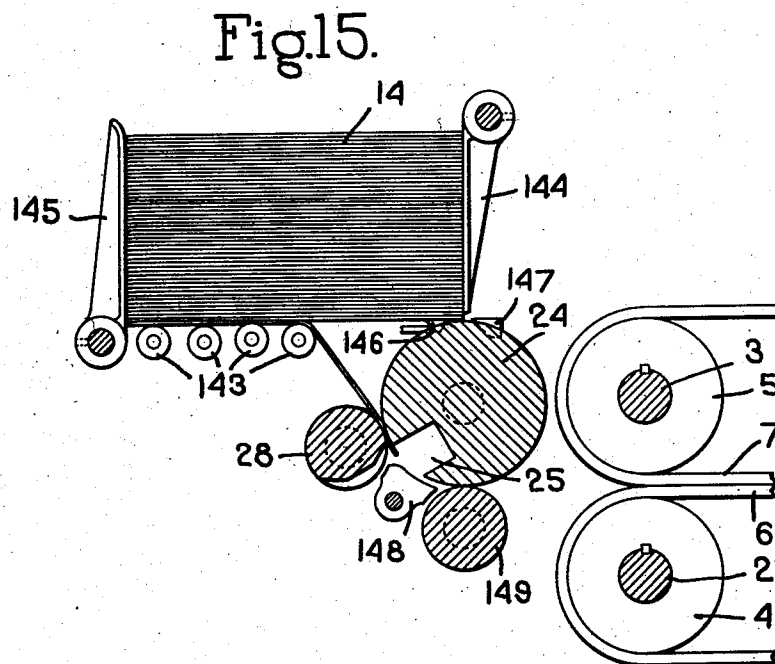
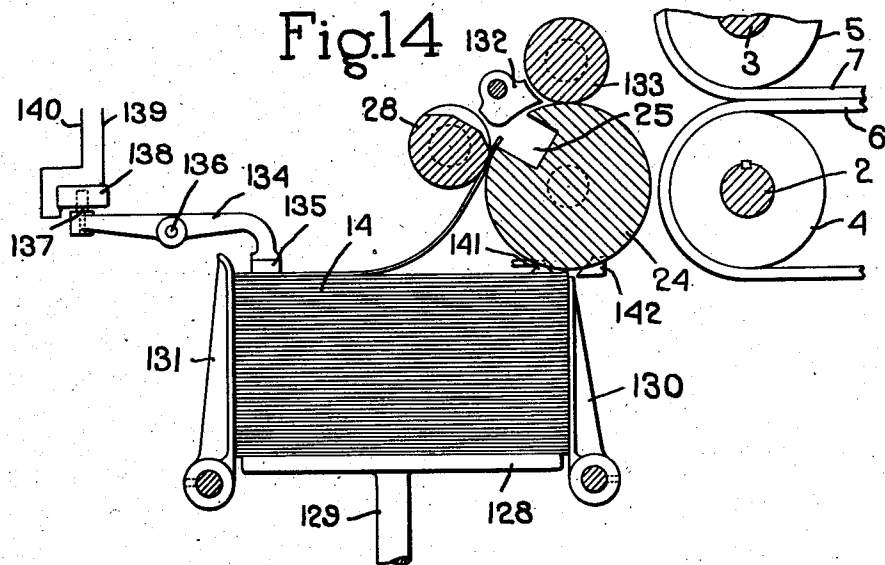
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SHEET FEEDING MECHANISM

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5 Sheets-Sheet 5



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2,369,914

SHEET-FEEDING MECHANISM

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Application August 26, 1942, Serial No. 456,199

27 Claims. (Cl. 271-29)

This invention relates to improvements in automatic mechanism for feeding sheets or blanks of fibrous or other material from a stack in rapid succession and delivering the same to other mechanisms in timed accurately registered relation so that further operations may be performed upon the sheets or blanks progressively.

I am aware that other types of automatic feeders have been made which will remove one blank at a time from a stack of blanks and prearranged in registry after such feeding before they are delivered to mechanism for producing succeeding operations.

In such feeding machines the separation and removal of one blank from the stack frequently disturbs other blanks particularly when the stacked blanks are so supported that pressure exists between the blank being fed and the next succeeding blank. This is especially true of blanks having window openings or so shaped that portions of one blank may catch or lock upon the next succeeding blank.

One of the objects of the invention is to provide mechanism for maintaining sufficient pressure upon the blanks in the stack to prevent displacement of the sheets therein in combination with mechanism for engaging and progressively deflecting an outermost sheet of the stack throughout its width and then bending the deflected sheet away from the stack throughout the major portion of its length and thereafter slidably withdrawing the sheet from the stack thereby preventing catching or interlocking of any portion of the outermost sheet with the next adjacent sheets during such withdrawal from the stack.

Another object of the invention is to provide a construction in which the stack is gradually fed against an abutment as successive outermost sheets are removed to produce a desired frictional engagement with the abutment which will hold the sheet from removal from the stack until a greater part of the sheet has been bent out of contact with the next adjacent sheet and then slidably withdrawn from such frictional engagement with the abutment so that the outermost sheet will be delivered to a sheet-receiving and forwarding means in proper registry.

A further object of the invention is to provide adjustable means for producing a desired degree of friction between the outermost sheet and the abutment.

Another object of the invention is to provide gripping means preferably operable by suction for deflecting a corner of the outermost sheet from

the next succeeding sheet of the stack, in combination with means for preventing displacement of the next succeeding sheet and continuing the deflection of the outermost sheet, and comprising means for engaging the deflected corner portion of the sheet and continuing the deflection of the sheet throughout the width thereof and finally slidably withdrawing the sheet from the stack.

Another object of the invention is to provide mechanism for actuating the gripping means after it has deflected the corner portion of the sheet to restore the gripping means into operative relation to the next succeeding sheet before the outermost sheet is fully withdrawn from the stack and which preferably will aid in continuing the deflection of the edge portion of the sheet during such movement. By virtue of this construction the restoration of the gripping means into engagement with the next succeeding sheet of the stack enables the feeding mechanism and the sheet-receiving mechanism to be operated at a considerably increased rate of speed.

Another object of the invention is to provide means which can be quickly adjusted to feed sheets of fractionally shorter length than that of the maximum sheet to the sheet-receiving means without increasing the linear speed of the feeding mechanism so that, for example, sheets one-half of the length of the maximum sheet will be delivered to the sheet-receiving means at the same rate of speed as that employed for feeding the longer sheets.

Another object of the invention is to provide feeding mechanism comprising means for supporting a stack of sheets on edge in inclined upright position relatively to the sheet deflecting and forwarding means having means for progressively forcing the lower end portions of the sheets against a suitable abutment with predetermined adjustable pressure and having means for vertically adjusting the sheet-supporting means to present sheets of different lengths properly to the deflecting and forwarding means.

Another object of the invention is to provide mechanism for successively separating outermost sheets from a stack of sheets comprising means for supporting the stack with an end portion thereof in proximity to, or resting against, a rotatable drum having means for engaging and progressively deflecting the edge of the outermost sheet or for receiving a previously deflected edge portion thereof and continuing said deflection.

A further object of the invention is to provide means for adjusting the inclination of the stack

of sheets relatively to the sheet deflecting means to increase or decrease gravity pressure between the sheets of the stack.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawings and will be particularly pointed out in the claims.

Preferred embodiments of the invention are illustrated in the accompanying drawings, in which,

Fig. 1 is mainly a side elevation showing a portion of the end of a sheet-receiving and forwarding means and the sheet feeding mechanism assembled thereupon;

Fig. 2 is a detail view illustrating a portion of the upper end of the stack with the suction operated gripping mechanism in engagement with the outermost sheet of the stack together with a cam mechanism for actuating the gripping mechanism and also illustrating a separator positioned beyond the edge of the sheet and the cam mechanism for actuating the separator;

Fig. 3 is a similar detail view showing the position of the gripping mechanism after having deflected a corner portion of the sheet from the stack with a separator partially moved into a position to engage the edge of the deflected outermost sheet and engaging the next sheet of the stack to hold it from displacement;

Fig. 4 is a similar detail view showing the separator fully moved into engagement with the deflected portion of the sheet and the stack and illustrating a position of the gripping mechanism as it is being restored to gripping relation to the next succeeding sheet of the stack before the sheet is completely withdrawn from the stack;

Fig. 5 is a perspective view from the rear of portions of the feeding mechanism illustrating particularly the longitudinally slotted rotatable member for progressively deflecting the end portion of the sheet widthwise, the abutment which engages the lower end portion of the stack as illustrated in Fig. 1, and the mechanism for supporting the lower end of the stack and progressively forcing the stack against the abutment as succeeding outermost sheets are removed;

Fig. 6 is a detail perspective view of the upper portion of the stack showing the deflected corner portion of the outermost sheet retained in deflected position by the separator and preliminarily engaged by the wall of the slot for continuing widthwise deflection of the sheet and showing the suction-actuated gripping mechanism about to be restored to position to engage the next succeeding sheet of the stack before withdrawal of the outermost sheet from the stack;

Fig. 7 is a detail perspective view from the rear illustrating the slotted rotatable member for deflecting the edge portion of the sheet widthwise, the roller which cooperates therewith, and the driving mechanism for synchronising the operation of the sheet feeding mechanism with the sheet receiving and forwarding mechanism;

Fig. 8 is a view mainly in end elevation showing the manner in which the inclination of the stack-supporting means may be adjusted and also illustrating the manner in which an adjustable controller for intermittently applying suction to the gripping means is mounted upon the frame of the machine, it being understood that the controller may be similarly mounted upon the non-adjustable feeding mechanism;

Fig. 9 is a detail plan view, viewed downwardly

in the direction of the axis of the suction tube shown in Fig. 10, comprising a modified form of suction operated gripping mechanism, the means for actuating the same, the suction controller and a vertically movable separator and its actuating mechanism;

Fig. 10 is a vertical sectional view on line 10—10 Fig. 9, showing the suction gripping mechanism in engagement with the corner of the outermost sheet, the mechanism for actuating the same, the vertical separator and its actuating mechanism and the rotatable members which engage the deflected end of the sheet, and the companion roller cooperating therewith to forward the sheet to sheet-receiving means a portion of which is diagrammatically illustrated;

Fig. 11 is a detail view of the suction controller the cover being removed;

Fig. 12 is a detail vertical sectional view on line 12—12 Fig. 11;

Fig. 13 is a view illustrating the adjustable means for selectively controlling the timing of the application of suction to the gripping and deflecting means to enable long sheets or sheets of half the length of long sheets to be fed to the sheet-receiving and forwarding means at the same speed;

Fig. 14 is a detail diagrammatic view mainly in side elevation of a modification of the invention for successively feeding the uppermost sheet from a horizontal stack; and,

Fig. 15 is a similar view of a modification of the invention for successively feeding the lowermost sheet from a horizontal stack.

The embodiments of the invention illustrated herein comprise mechanism for successively feeding an outermost sheet of a stack rapidly and in proper registry to a sheet-receiving and forwarding means for presenting the sheets successively in proper registry for subsequent operations thereupon. Any suitable sheet receiving and forwarding means may be employed. As illustrated herein the sheet-receiving and forwarding means comprises a frame 1 having mounted therein suitable shafts 2 and 3 of suitable pulleys or drums 4 and 5 upon which are mounted cooperating endless bands 6 and 7 the adjacent runs of which engage the bottom and top of the sheets which are forwarded by the feeding mechanism and carry them to mechanisms for performing subsequent operations upon them. In the construction illustrated in Fig. 1 the feeding mechanism is mounted upon a supplemental frame 8 which is bolted or otherwise secured to the end of the frame of the feeding and forwarding mechanism. The supplemental frame is provided with end plates 9 and 10 which are connected by tie rods 11 and 12 and 13, as more clearly illustrated in Fig. 5.

In the particular construction illustrated in Figs. 1, 5 and 7, the stack of sheets or blanks 14 rests at its lower end upon two or more endless carriers 15 which preferably have outwardly projecting short teeth which engage the bottom edges of the sheets of the stack. The endless carriers 15 are mounted upon suitable pulleys or sprockets carried upon shafts at the end of parallel bars 16 which are secured to extensions 17 of racks 18 which are slidably mounted in suitable brackets 19 which in turn are slidably and adjustably mounted upon the tie rods 12 and 13 and adapted to be clamped thereon in adjusted positions to space the carriers properly for stacks of sheets having different widths. A shaft 20, which is journaled in the end frames 9 and 10, ex-

tends through the brackets 19 and has slidably feathered upon it suitable gears (see Fig. 1) which mesh with the racks 18. One or both ends of the shaft 20 may be provided with angular extensions adapted to be engaged by a crank for rotating the shaft 20 and thereby to adjust the carriers simultaneously upwardly or downwardly in accordance with the length of the sheets of the stack to present the upper end of the stack properly to the mechanism for successively removing the outermost sheets therefrom and presenting them to the sheet receiving and forwarding mechanism. Any suitable means may be provided for locking the shaft when the desired adjustment has been made.

The bars 16 which support the endless carriers 17 are provided with upwardly extending bosses or members 21 in which are mounted an abutment bar 22 which engages the outermost sheet of the stack. The abutment bar desirably is provided with a frictional insert 23, such as fibre or rubber, to increase frictional engagement of the lower end portion of the outermost sheet of the carrier.

In the operation of the machine the stacks are vertically adjusted to such position that the upper end of the outermost sheet will engage or lie in close proximity to the periphery of a feed drum or rotatable member 24 having a slot 25 extending longitudinally thereof and at an angle to the axis of its shaft. One end portion of the feed drum is provided with a beveled or cut-away portion 26 so that the end of the opposite wall of the slot will present an overhanging corner or beak 27 adapted to engage a deflected corner portion of the outermost sheet, as will hereinafter more fully appear. A complementary roller 28, which may be of smaller or larger diameter than the feed drum 24, is mounted in cooperative relation to the rotatable feed drum and is provided with a cut-away portion 29 complementary to the slot in the feed drum 24 to permit deflection of the edge portion of the sheet throughout its width before the sheet is engaged in the bite of the cooperating cylindrical surfaces of the rolls 24 and 28 which then act positively and uniformly to withdraw the outermost sheet from the stack and advance it in proper registry to the cooperating sheet forwarding belts 6, 7.

Means are provided, hereinafter described, for deflecting a corner portion of the outermost sheet into the path of the beak 27 of the feed drum. The slot of the feed drum has such angular relation to the axis thereof that upon continued rotation of the rotatable drum the edge of the sheet will be progressively deflected widthwise throughout its entire width and thereupon engaged by the bite between the feed drum 24 and the companion roller 28 so that the sheet will be fed forward in proper registry to the bands or belts 6 and 7 of the sheet-receiving means.

Suitable means are provided for engaging the side edges of the sheets to maintain the stack from lateral displacement such as a plate 30 which is mounted upon a guard or web member of a bracket 31 carried by the tie rods 11 and desirably provided with an extension projecting beyond the outermost sheet of the stack to engage the side edge of the outermost sheet as it is deflected. Retaining members such as leaf springs 32 desirably are adjustably secured to the plates 30 and engage the side edges of the stack and may be adjusted to such position as to retain the next outermost sheet of the stack from dis-

placement while the outermost sheet is deflected from the stack, as illustrated in Fig. 6.

Means are provided for progressively forcing the lower end of the stack against the abutment as successive sheets are removed therefrom at a predetermined adjustable pressure. As illustrated herein the forward pulleys or sprockets upon which the endless carriers 16 are mounted are fixedly secured to a shaft 33 which has secured upon it a pulley 34 which is driven by a belt 35 which is driven by a suitable pulley 36 on the shaft 2 of the sheet-receiving and forwarding means. The upper and lower runs of the belt 35 pass beneath pulleys 37 and 38 which are mounted upon a take-up lever 39 which is fulcrumed upon a stud 40 which is mounted in the end frame 10. The take-up lever 39 has adjustably secured to its opposite end a rod or bar 41 upon which a suitable weight 42 is adjustably mounted.

By reason of the construction above described any desirable tension may be imposed upon the belt 35 which will so frictionally drive the pulley 34 as to cause the carrier to produce the desired pressure of the lower portion of the stack against the abutment in accordance with the character of the sheets of the stack which are being fed.

In the present invention suitable mechanism is provided for deflecting a corner portion of an outermost sheet of the stack from the stack into the path of the corner or beak 27 of the wall of the angularly disposed slot of the rotatable member 24. The feed drum or rotatable member 24 is fixedly secured to a shaft 43 which is journaled in the side members of the supplemental frame which carries the feeding mechanism. The corner deflecting mechanism is mounted on the bracket 31 which is carried by the tie rods 11. The preferred mechanism for deflecting the corner portion of the sheet which is illustrated herein comprises a gripping member preferably having suction means for engaging the face of the outermost sheet of the stack in proximity to its corner and means for actuating the same to deflect the corner portion of the sheet away from the stack, thereafter to move the gripping member beyond the edge of the sheet and to restore it into position to engage the next succeeding sheet before the sheet is fully withdrawn from the stack. A separator, which is provided to cooperate with the corner deflecting mechanism, is normally located in proximity to an edge of the sheets of the stack and means are provided for actuating the separator in timed relation to the gripping means to insert the separator between the deflected portion of the foremost sheet and the next succeeding sheet thereby to continue the deflection of the foremost sheet and to engage the next succeeding sheet and restrain it from deflection while the gripping mechanism is removed from its engagement with the foremost sheet and restored to operative relation to the next succeeding sheet. Desirably the gripping mechanism is so constructed and actuated that a portion thereof will during its movement to the position in which it engages the face of the next foremost sheet engage the rear face of the deflected foremost sheet and aid in assuring the continued deflection thereof into the slot in the rotatable member.

The particular form of gripping mechanism which is illustrated herein comprises a metal tube 44 which is rotatably and reciprocally

mounted in suitable bearing members 45 and 46 (Figs. 1, 2, 3 and 4). The tube is provided near its end with a laterally extending hollow arm 47 having at the free end thereof a conical suction cup 48, as more fully illustrated in Figs. 2, 3, 4 and 6, adapted to engage the exposed face of the outermost sheet. The tubular member 44 has secured to it intermediate of its length an arm 49 provided at its end with a preferably ball-shaped cam follower 50 adapted to engage a compound cam 51 formed with a cam groove 52 to impart a swinging movement to the arm 47 which carries the suction cup 48 and also a surface cam 53 for moving the tube 44 axially of its bearings. Suitable means such as a spring 54 connected to the tube 44 and to a stationary part of the machine serves to maintain the cam follower in contact with the surface cam 53. The compound cam is so constructed as to move the suction cup 48 into engagement with the face of the outermost sheet of the stack at which time suction is applied to cause the suction cup to grip the sheet. Further rotation of the cam thereupon swings the arm 47 outwardly thereby deflecting the corner portion of the sheet toward the slotted rotatable member. Further rotation of the compound cam causes the surface cam to raise the tube 44 sufficiently to move the suction cup beyond the end of the sheet and the grooved cam thereupon acts to swing the gripping member over the edge of the deflected corner portion and concurrently therewith the surface cam together with the spring 54 move the tube 44 and suction member downwardly in the rear of the deflected end portion of the sheet and thereafter move the suction cup into engagement with the next succeeding sheet.

The lower end of the tube 44 desirably is provided with a conical plug or closure 55 which, as the pipe 44 moves downwardly, engages the reverse surface of the deflected outermost sheet, as illustrated in Fig. 6, and assists in the further deflection of the sheet toward the slot 25 in the feed drum 24.

During the deflection of the corner portion of the outermost sheet a separator is introduced between the deflected portion of the sheet and the next succeeding sheet.

The preferred form of deflector which is illustrated herein is a wedge-shaped plate or block 56 which is rigidly secured to the offset portion 57 of a bell crank arm 58, which is pivotally mounted on the bracket 46. The other arm 59 of the bell crank is provided with a follower 60 which engages a grooved cam 61 which is fixedly secured to the shaft 62 upon which the compound cam 51 is mounted. By reason of this construction proper timing relation of the gripping mechanism and separator is insured.

The relative movements of the gripping mechanism and the separator mechanism are illustrated in Figs. 2, 3, and 4, in which Fig. 2 illustrates the relative positions of the gripping mechanism with the suction cup engaging the face of the outermost sheet and the separator 56 removed from the stack. Fig. 3 illustrates the position of the gripper mechanism after having preliminarily deflected the corner portion of the sheet with the separator moved to a position in which the inclined face thereof engages the edge portion of the deflected sheet and is in position upon further movement to increase the deflection thereof with its flat face engaging the next sheet and acting to restrain deflection of that sheet. Fig. 4 illustrates the position of the

parts when the wedge mechanism is fully inserted to retain the deflected end of the outermost sheet in position to be engaged by the wall of the slot 25 in the rotatable member and shows the gripping mechanism in its position after having been raised beyond the upper edge of the foremost sheet and forced downwardly between the outermost sheet and the next succeeding sheet but before the suction cup thereof is restored to engagement with the face of the next succeeding sheet.

While the separator is illustrated herein as being located at the side of the stack and adapted to enter horizontally between the deflected portion of the foremost sheet and the next succeeding sheet in the stack, it will be understood that suitable mechanism may be provided for positioning and actuating the separator in a vertical direction to perform the same function in which case the separator may be located at a desirable position widthwise of the stack.

In the operation of the machine the corner deflecting and separating mechanism are operated in such timed relation that the gripper first engages the face of the corner portion of the outermost sheet and deflects it away from the stack. The separator then enters between the deflected portion of the sheet and the stack and continues the deflection of the uppermost portion of the sheet. During such deflection by the separator the gripper is moved upwardly out of engagement with the face of the sheet, the suction applied to the suction cup desirably but not necessarily having been discontinued. The gripping means then moves downwardly causing the end portion 55 of the tube 44 to engage the deflected foremost sheet and continues the deflection of the foremost sheet, if necessary to assure the entrance of the edge of the sheet into the slot 25 of the rotatable member or feed drum, and finally moves into engagement with the next sheet of the stack before the outermost sheet is fully withdrawn by the feed drum and its co-operating roller.

By reason of the fact that the slot 25 is in proper angular relation to the longitudinal axis of the feed drum 24 the edge portion of the sheet is progressively deflected widthwise of the sheet as it enters the slot 25 so that when the cylindrical periphery of the feed drum is brought into cooperation with the companion roller 28 the sheet will be gripped therebetween and fed accurately longitudinally of the sheet receiving mechanism and in proper registry for further operations upon the sheet. It will be noted that by reason of the operation of the mechanisms above described the corner portion of the sheet is first deflected from the next adjacent sheet, then progressively deflected from the corner portion of the sheet widthwise of the sheet, and the sheet bent away from the next succeeding sheet throughout the greater portion of its length as illustrated in Fig. 1 before being gripped between the cylindrical surfaces of the rotatable member 65 and the companion roller 28 so that the other end of the sheet will be slidably withdrawn from its frictional engagement between the surface of the abutment 22 and the next succeeding sheet. By thus deflecting and bending the sheet any catching or interlocking between the outermost sheet and the next succeeding sheet will be avoided even though the sheets are provided with slitted or cut-out portions for window openings or the like.

Suitable means are provided for actuating the

feeding mechanism in synchronized relation to the movement of the sheet receiving and forwarding mechanism. As illustrated in Fig. 7 the shaft 2 of the sheet forwarding mechanism, which is positively driven, is provided with a gear 63 which meshes with a pinion 64 which is mounted upon a suitable stud shaft in the end plate of the supplemental frame and engages a pinion 65 upon the shaft of the roller 28. The pinion 65 in turn engages a gear 66 which is fixedly secured to the shaft 43 of the feed drum 24 having the slot 25.

The shaft 43 preferably has secured to its opposite end a sprocket 67 which engages a sprocket chain 68 which in turn drives a sprocket wheel 69 upon the shaft 62 upon which is mounted the compound cam 51 which actuates the gripping mechanism and also the cam 61 which actuates the separator.

In the construction illustrated the driving mechanism is so constructed that the cam shaft revolves once to every revolution of the slotted feed drum and if suction is continuously maintained upon the gripping mechanism the outermost sheet of the stack will be deflected, withdrawn from the stack, and fed to the sheet receiving mechanism upon each rotation of the feed drum. In such case the suction gripper will be drawn upwardly out of engagement with the face of the foremost sheet and thereafter inserted between the reverse face of the foremost sheet and the next succeeding sheet of the stack without interruption of the vacuum imposed upon the suction cup.

However, suitable mechanism may be provided of a usual character for breaking the vacuum upon the suction cup before it begins its upward movement. If longer sheets are to be fed suitable means may be provided for applying suction to the suction cup at each second revolution of the feed drum as will hereinafter more fully appear.

A modified form of the invention adapted thus selectively to apply suction to the sheet deflecting mechanism every other revolution of the drum, or alternatively upon every fourth revolution of the drum, is illustrated in Figs. 8-9. This embodiment of the invention also comprises means for adjusting the inclination of the stack in order to increase or decrease gravity pressure between the sheets of the stack.

In the construction shown in Fig. 8 the frame 1 of the receiving and forwarding mechanism, in which the shafts 2 and 3 of the pulleys 4 and 5, which drive the receiving and forwarding belts 6 and 7, are mounted is of somewhat different construction and provided with an extension 70 from which upwardly inclined side frames 71 extend and which are connected by suitable tie rods 72 corresponding to the tie rods 11 of the construction heretofore described. A bracket 73, which corresponds to the bracket 31 previously described, is mounted on the tie rods 72 and has a downward extension 74 in which one end of the shaft 43 of the slotted feed drum 24 is mounted. The opposite end of the shaft 43 is mounted in the opposite side frame 71 and actuated by suitable gearing from the shaft of the companion roll 28 which as illustrated in Figs. 8 and 10 is of relatively larger diameter than the feed drum 24 and driven at a suitable peripheral speed to cooperate with the feed drum 24.

By so mounting the shaft 43 of the feed roll sufficient space is provided between the extension 74 of the bracket 73 and the adjacent side frame to permit proper swinging movement of

the gripping mechanism employed and corresponds to the space between the end of the feed drum and the adjacent side frame in the construction previously illustrated, in which sufficient space is provided between the end of the feed drum and the side frame to permit a swinging movement of the gripping mechanism.

In the construction illustrated in Fig. 8 adjustable means are provided for supporting stacks of sheets of different lengths in combination with the means for adjusting the inclination of the stack for the purpose heretofore described.

This construction comprises a magazine having a back plate 76 against which the outermost sheet of the stack 14 rests and a vertically adjustable carriage 77 which supports the bottom end of the stack and is slidably mounted upon a frame comprising side bars 78 having ears 79 which are connected by suitable shafts 79x, to parallel levers 80 having offset upper ends which are fulcrumed on studs 81 on the extensions 71 of the main frame 1. The back plate 76 is also provided with suitable ears which are mounted on the shaft 79x of the adjustable frame.

Bars 82, which are pivotally connected to the lower end portions of the levers 80, are provided with racks which engage suitable gears 83 fixedly secured to a shaft which is journaled in the main frame 1 of the receiving and forwarding mechanism which may be rotated to advance or retract the rods 82 and thereby adjust the inclination of the stack supporting means, suitable means not shown being provided to lock the shaft when the magazine is properly adjusted.

The lower end of the stack 14 is supported upon endless carriers 84 which extend beneath the lower end of the back plate 76 and suitable means are provided for actuating the carriers to advance the stack against the back plate upon successive removal of the outermost sheets thereof in the manner heretofore described.

Suitable means well known in the art may be provided for adjusting the carriers toward or away from each other to accommodate different widths of stacks of sheets.

Suitable means are provided for adjusting the carriage upwardly or downwardly to position stacks of long sheets or short sheets properly with respect to the feed drum. As illustrated in Fig. 8 the side bars 77 are provided with teeth forming racks 85 which are engaged by gears 86 which are fixedly secured upon a shaft 87 which is journaled in the side plates of the carriage and suitable means may be provided for locking the shaft 87 against rotation when proper adjustment of the carriage is secured.

In the construction illustrated in Figs. 8, 9, and 10, mechanism similar to that heretofore described is provided for actuating the gripping mechanism to deflect the upper corner of the sheet, but in this construction the separator mechanism is located above the edge of the stack and is moved vertically instead of laterally as in the construction previously described.

In the construction shown in Figs. 8-10 the gripping mechanism comprises a tube 89 which is mounted in suitable bosses 90 and 91 extending from the bracket 73. An arm 92, which is fixedly secured to the tube 89, is provided at its end with a follower 93 which engages a compound cam 94 which may be and preferably is identical with the compound cam 51 previously described and acts to rotate the suction cup of the gripper mechanism into engagement with the outermost sheet,

then swing it laterally to deflect the corner portion of the sheet. The compound cam 94 then raises the gripping mechanism upwardly above the upper edge of the sheet, then moves it inwardly, and finally downwardly between the outermost sheet and the next succeeding sheet in the manner heretofore described.

In this construction the lower end of the tube 89 is provided with a lateral arcuate extension 95 having at its end a suction cup 96 corresponding to the suction cup 48 in the construction disclosed in Figs. 1-4, the extension 95 being of arcuate form to avoid interference with the separator which moves upwardly and downwardly instead of laterally as in the construction illustrated in Figs. 1-4.

The separator comprises a bar 97 which is slidably mounted in the boss 91 and is provided at its lower end with a wedge-shaped plate or block 98 similar to that previously described. The bar 97 has secured to its upper end an arm 99 which engages a cam 100 which is mounted upon the cam shaft 101 upon which the compound cam 94 is mounted and which corresponds to the cam shaft 62 of the construction illustrated in Figs. 1-4. The cam 100 is so constructed as normally to cause the separator to engage the outer face of the foremost sheet, as illustrated in Fig. 10, until the suction cup is placed in contact with the surface of said sheet, and then to raise the separator above the edge of the stack before the gripper is actuated to deflect the uppermost corner of the sheet from the stack. After the deflection of the corner of the sheet the arm 99 is forced downwardly upon the low portion of the cam 100 by the spring 102, thus causing the separator to descend into engagement with the next outermost sheet and hold it from deflection and the inclined portion of the separator to engage the rear face of the deflected sheet to hold it in deflected position, while the gripping mechanism is raised over the edge of the sheet and positioned in proper relation to the next succeeding sheet, as heretofore described.

In order to feed sheets of different predetermined lengths to the sheet receiving and forwarding mechanism without varying the speed of either the sheet feeding mechanism or sheet forwarding mechanism, novel means are provided in the present invention for controlling the suction which is applied to the gripping means which will enable the gripping means to engage the face of the foremost sheet upon each oscillation and reciprocation of the gripping mechanism to feed short sheets, the length of which does not exceed the circumference of the drum, or upon every other oscillation and reciprocation of the gripping mechanism to feed in sheets not exceeding twice the circumference of the drum, and it will be understood that by proper changes in the gear ratio which drives the cam shaft and the controlling mechanism suction may be applied to the gripping mechanism in proper timed relation to the feed drum to cause the gripper to engage shorter sheets upon every second actuation of the gripping mechanism and to grip the long sheets upon every fourth actuation of the gripping mechanism. The controlling mechanism may therefore be applied to feeding mechanism such as illustrated in Fig. 1 and which employs a large feed drum having a single revolution for feeding each short sheet and two revolutions for feeding sheets twice the length, or may be applied to constructions such as illustrated in Fig. 8 having a smaller feed drum having two revolutions for

feeding short sheets and four revolutions for feeding long sheets.

To avoid obscurity in illustration the controller mechanism is illustrated in Fig. 8 as mounted upon one of the side frames 71 of the machine, but it will be readily understood that it may be mounted upon the side frame 9 of the construction illustrated in Figs. 1, 5, and 7, as the driving mechanism for the controller is in each case mounted upon the cam shaft 43 or 101 the cams of which actuate the gripping mechanism and the separator.

The controller, which is illustrated in Figs. 11, 12 and 13, comprises a cylindrical casing or body 103 which, as illustrated in Fig. 8, is suitably secured to the side frame 71 and is provided with a boss 104 forming a bearing for the cam shaft 101. The opposite side of the body or casing is provided with a cylindrical recess 105 and with diametrically oppositely disposed channels 106 and 107 each of which communicates at both ends with the cylindrical recess 105.

A pinion 108, which is mounted on the end of the cam shaft 101, engages an internally toothed ring gear 109 which is journaled in the cylindrical recess 105. A peripheral portion of the gear 109 is provided with a channel 110 which is adapted to establish communication between adjacent ends of the channels 106 and 107. The ring gear 109 therefore forms a valve adapted to establish communication with diametrically opposite adjacent ends of the channels 106 and 107 twice during each revolution of the ring gear or valve.

The casing 103 is provided with preferably diametrically opposite bosses 111 and 112 having radial bores which communicate respectively with the channels 106 and 107. A pipe 113, which is mounted in the boss 111, communicates with a suitable suction pump or the like and a similar pipe 114 which is connected to the boss 112 is connected by a flexible pipe 115 to the upper end of the tube 89 which leads to the gripper, as illustrated in Fig. 9, or to the pipe 44 which leads to the gripper, as illustrated in Figs. 1-4 inclusive.

The casing 103 is provided with a cover plate 116 which tightly fits upon the face of the casing and is secured thereto by a series of screws or bolts 117 and serve to hold the internally toothed valve gear 109 in place and also to form a closure for the sides of the channels 106 and 107.

The pitch diameter of the pinion 108 to that of the ring gear or valve 109 is 1 to 2 as illustrated in Fig. 11 so that each revolution of the cam shaft rotates the ring gear or valve a half revolution. During one-half revolution the channel 110 of the ring gear valve establishes communication with adjacent ends of the channels 106 and 107 in the casing, as illustrated in Fig. 11, thereby establishing communication between the suction producing means and the suction gripper, and upon the second revolution of the pinion 108 establishes communication between the diametrically opposite ends of the channels 106 and 107 thereby again establishing communication between the suction means and the gripper so that suction is applied to the gripper upon every revolution of the cam shaft which, as illustrated in Fig. 1, is coincident with every revolution of the feed drum. Thus the gripper is enabled to engage and deflect the corner portion of each sheet upon each revolution of the feed drum.

The controller is, however, provided with means for closing the channel 107 in the casing. As illustrated herein the means comprises a cylindrical valve 118 which is mounted in the casing 103

and extends transversely across the channel and is provided with a port 119 to register with the channel when in the position illustrated in Fig. 11, but which may be rotated at right angles thereto to close the channel 107. The valve 118 is provided with a preferably milled head 120 to enable it to be readily grasped and rotated by the operator.

Desirably means are provided for limiting the rotation of the valve either to open or closed position. As illustrated in Fig. 13 a plate 121, which is secured to the casing 103 by a screw 122, is provided with a forked end which embraces the stem of the valve 118 and presents stops 123 and 124 suitably spaced apart and adapted to engage a pin 125 extending inwardly from the head 120, the stops 123 and 124 being so located that when the pin 125 engages the stop 123 the valve 118 will be fully open and when the pin is rotated into engagement with the stop 124 will be fully closed. When therefore the valve 118 is in closed position no suction can take place from the suction producing means through the channels 106 and 107 to the gripper and suction upon the gripper will only be established when the channel 110 of the valve communicates with the diametrically opposite ends of the channels 106 and 107. Thus suction can be applied to the gripper only upon every second revolution of the drum.

By reason of this construction therefore short sheets not exceeding in length the periphery of the drum will be successively deflected to the feed drum upon every revolution of the drum and when longer sheets not exceeding twice the periphery of the feed drum are to be fed the suction mechanism will be actuated upon every second revolution of the feed drum.

The construction illustrated in Figs. 8-10 differs from that illustrated in Figs. 1-5 in that the feed drum 24 is half the diameter of the cooperating companion roller 28, the drum 24 being driven in a 2 to 1 ratio from the shaft of the roller 28 by friction or by suitable gearing having the same pitch diameter as the drum and roller. The cam shaft 101 is driven from the shaft of the feed drum by suitable gearing including an intermediate idle gear 126 which engages a companion gear 127 of the cam shaft 101, the pitch diameter of the gear 127 being the same as that of the roller 28.

By reason of this construction the pinion 108 on the cam shaft will be rotated once to every second revolution of the feed drum 24 and the ring gear valve 109 will be revolved once in every four revolutions of the feed drum. When therefore the valve 118 of the controller is in open position illustrated in Fig. 11, so that the channel 110 of the ring gear valve establishes communication between the channels 106 and 107 twice during every revolution of the ring gear valve, suction will be applied to the gripping mechanism to deflect the end of a short sheet into the slot of the feed drum upon every second revolution of the feed drum. When the valve 118 is closed suction will be applied to the gripping mechanism only upon every fourth revolution of the feed drum.

Another embodiment of the invention is illustrated in Fig. 14 in which the stack 14 of superimposed sheets are carried by a horizontal support 128 carried by a vertically adjustable standard 129 adapted to be raised by mechanism operated by an electric motor. In this construction guides 130 and 131 engage the ends of the sheets and similar guides may be provided for the sides

of the sheets. The feed drum 24 is located in proper juxtaposition to the sheet receiving and forwarding mechanism which comprises the pulleys 2 and 5 and the cooperating endless bands 6 and 7. The roller 28 which cooperates with the feed drum is located above the stack of sheets and means, such as a curved guide 132 and a suitably driven roller 133, serve to guide the uppermost sheet as it is removed from the stack by the feed drum into the bite of the endless bands 6 and 7. In this construction a feeler lever 134, which is provided with a suitable head 135 to engage the outermost sheet, is fulcrumed intermediate of its length upon a shaft 136 and the opposite end of the feeler is provided with means to engage the plunger 137 of a snap switch 138 of a usual character in an electric circuit having conductors 139 and 140 leading to the motor which elevates the standard 129 and the stack support 128 as will be readily understood by those skilled in the art. The sheet gripping and deflecting mechanism is of the character above described and is graphically illustrated in Fig. 14 as having suction gripping mechanism including a suction cup 141 and a separator 142 which are constructed and operated in a manner similar to those heretofore described.

As each outermost sheet is withdrawn from the stack by the feeding mechanism the head 135 of the feeler will descend thereby raising the opposite end of the feeler and causing the snap switch to complete the circuit to the electrically operated mechanism which lifts the standard 129 and the stack supporting plate 128. As soon as the uppermost sheet of the stack is positioned properly with respect to the feed drum the head 135 of the feeler will be released from engagement with the plunger 137 of the snap switch and permit the snap switch to break the circuit and thus arrest further upward movement of the stack. As snap switch mechanism of the above character is very sensitive the outermost sheets of the stack will be successively positioned accurately with respect to the feed drum and the corner deflecting and separating mechanism.

Another embodiment of the invention is illustrated in Fig. 15 in which the feeding mechanism is reversely arranged to deflect and withdraw the sheets from the bottom of the stack which is supported upon a series of rollers 143 which underlie a sufficient portion of the stack to support sheets in substantially horizontal relation with the end of the stack resting upon the feed drum 24. In this construction, as in that illustrated in Fig. 14, suitable guides 144 and 145 engage the respective ends of the stack and other guides desirably are provided for the edges of the stack. The gripping mechanism comprises a suction head 146 and a separator 147 which are similar to those heretofore described are similarly actuated for deflecting the corner portion of the outermost sheet into the slot 25 of the feed drum and a suitable guide 148 and guide roller 149 are provided for directing the sheet from the feed drum into the bite of the endless bands 6 and 7 of the sheet receiving and forwarding means.

It is therefore obvious from the above disclosure that various embodiments of the invention may be made and that various changes in form, construction and arrangement of parts may be employed within the spirit and scope of the following claims.

Having thus described the invention, what is

claimed as new, and desired to be secured by Letters Patent, is:

1. Sheet-feeding mechanism comprising means for mainly supporting a stack of sheets, a rotatable cylindrical drum engaging and supporting the edge portion of the stack adjacent to the end of the outermost sheet and having a slot in its periphery extending longitudinally thereof in such inclined relation to the axis of the drum as to receive an edge portion of the outermost sheet and progressively deflect said edge portion widthwise of the sheet away from the stack throughout its width while the cylindrical surface of the drum engages and supports the undeflected portion of said outermost sheet and also engages the next adjacent sheet and restrains the portions of both sheets which are engaged by the cylindrical surface of the drum from displacement.

2. Sheet-feeding mechanism comprising means for mainly supporting a stack of sheets, a rotatable cylindrical drum engaging and supporting the edge portion of the stack adjacent to the end of the outermost sheet and having a slot in its periphery extending longitudinally thereof in such inclined relation to the axis of the drum as to receive an edge portion of the outermost sheet and progressively deflect said edge portion widthwise of the sheet away from the stack throughout its width while the cylindrical surface of the drum engages and supports the undeflected portion of said outermost sheet and also engages the next adjacent sheet and restrains the portions of both sheets which are engaged by the cylindrical surface of the drum from displacement, and complementary means cooperating with said drum positively and uniformly to withdraw said outermost sheet from the stack upon completion of the widthwise deflection of the edge portion thereof away from the stack.

3. Sheet-feeding mechanism comprising means or mainly supporting a stack of sheets, a rotatable cylindrical drum engaging and supporting the edge portion of the stack adjacent to the end of the outermost sheet and having a slot in its periphery extending longitudinally thereof in such inclined relation to the axis of the drum as to receive an edge portion of the outermost sheet and progressively deflect said edge portion widthwise of the sheet away from the stack throughout its width while the cylindrical surface of the drum engages and supports the undeflected portion of said outermost sheet and also engages the next adjacent sheet and restrains the portions of both sheets which are engaged by the cylindrical surface of the drum from displacement, and a cylinder cooperating with said drum having a longitudinally extending recess complementary to the slot of the drum to permit said progressive deflection of the outermost sheet throughout its width, with the remaining cylindrical surface of said cylinder cooperating with that of the drum to withdraw the outermost sheet from the stack and positively and uniformly forward it in a straight path.

4. Sheet feeding mechanism having means for engaging and forwardly individual sheets, means for supporting a stack of sheets with an edge thereof in proximity to said forwarding means, suction actuated gripping means to engage the face of the edge portion of an outermost sheet, means for actuating said gripping means to deflect the edge portion of the outermost sheet for engagement with said sheet forwarding means, a separator, and means for actuating the

same to hold the edge portion so deflected and to prevent displacement of the next succeeding sheet, and means for moving said gripping means over the edge of the deflected sheet and for causing it to engage the reverse face of the outermost sheet and increase the deflection thereof thereby to insure engagement of the deflected end portion by said forwarding means.

5. Sheet feeding mechanism comprising means for supporting a stack of sheets, means for deflecting a corner portion of the outermost sheet from the stack, means for forwarding individual sheets located in proximity to the end of the stack having means for engaging the deflected corner portion and progressively continuing the deflection of the edge portion throughout the width thereof and upon completion of said deflection to withdraw the deflected sheet longitudinally from the stack and forward it to a sheet receiving means.

6. Sheet feeding mechanism comprising means for supporting a stack of sheets, suction actuated means for deflecting a corner portion of the outermost sheet from the stack, a separator, and means for actuating the same to hold the edge portion so deflected and to prevent displacement of the next succeeding sheet from the stack, sheet forwarding means having means to engage the deflected corner portion of the sheet and progressively to increase the deflection thereof throughout its width thereby to separate the major portion of the deflected sheet from the adjacent sheet of the stack, and means for moving said gripping means over the edge of the deflected sheet and for restoring it into operative relation to the next succeeding sheet before the outermost sheet is fully withdrawn from the stack by said forwarding means.

7. Sheet feeding mechanism comprising means for supporting a stack of sheets on edge in substantially upright position, means for deflecting an upper corner portion of an outermost sheet from the stack, and sheet forwarding means having means for engaging the deflected corner edge portion and progressively continuing the deflection thereof throughout the width thereof and upon completion of said deflection to withdraw the deflected sheet longitudinally from the stack and forward it to a sheet receiving means.

8. Sheet feeding mechanism comprising means for supporting a stack of sheets on edge in substantially upright position, means for deflecting an upper corner portion of an outermost sheet from the stack, a separator, and means for actuating the same to hold the outermost sheet so deflected and to prevent displacement of the next adjacent sheet of the stack, and sheet forwarding means having means for engaging the deflected corner edge portion and progressively continuing the deflection thereof throughout the width thereof and upon completion of said deflection to withdraw the deflected sheet longitudinally from the stack and forward it to a sheet receiving means.

9. Sheet feeding mechanism comprising means for supporting a stack of sheets on edge in substantially upright forwardly inclined position having an abutment engaging the foremost sheet in proximity to the lower edge thereof, means for deflecting the upper portion of the foremost sheet from the stack, a rotatable feed drum located in proximity to the upper end of the stack having means for engaging and progressively continuing in increasing the deflection of the upper portion of the sheet throughout its width

thereby to separate the major portion of the deflected sheet from the adjacent sheet of the stack and operable thereafter slidably to withdraw the sheet from engagement with said abutment.

10. Sheet feeding mechanism comprising means for supporting a stack of sheets on edge in substantially upright forwardly inclined position having an abutment engaging the foremost sheet in proximity to the lower edge thereof, means for deflecting the upper portion of the foremost sheet from the stack, a rotatable feed drum located in proximity to the upper end of the stack having means for engaging and progressively continuing and increasing the deflection of the upper portion of the sheet throughout its width thereby to separate the major portion of the deflected sheet from the adjacent sheet of the stack and operable thereafter slidably to withdraw the sheet from engagement with said abutment, and means for successively advancing the lower end of said stack against said abutment with predetermined pressure after each outermost sheet is withdrawn from the stack.

11. Sheet feeding mechanism for forwarding individual sheets in predetermined registry to a traveling sheet receiving and forwarding means comprising a feed drum having a longitudinally extending slot inclined to the axis of the drum and a cooperating roller having a complementary recess positioned to deliver the sheets to the sheet receiving means, an endless carrier for supporting a stack of sheets on edge in substantially upright forwardly inclined position with the upper edge of the sheet in proximity to said drum, an abutment engaging the lower end portion of the outermost sheet, means for deflecting an upper corner of the outermost sheet of said stack into engagement with the slot in said drum, whereby continued rotation of the drum will progressively continue the deflection of the sheet widthwise of the drum and upon completion thereof slidably withdraw the sheet from engagement with said abutment, and means operable from said sheet receiving means for actuating said carrier to maintain a predetermined pressure between the lowermost sheet and the abutment as successive sheets are withdrawn from the stack.

12. Sheet feeding mechanism for forwarding individual sheets in predetermined registry to a traveling sheet receiving and forwarding means comprising a feed drum having a longitudinally extending slot inclined to the axis of the drum and a cooperating roller having a complementary recess positioned to deliver the sheets to the sheet receiving means, an endless carrier for supporting a stack of sheets on edge in substantially upright forwardly inclined position with the upper edge of the sheet in proximity to said drum, an abutment engaging the lower end portion of the outermost sheet, means for deflecting an upper corner of the outermost sheet of said stack into engagement with the slot in said drum, whereby continued rotation of the drum will progressively continue the deflection of the sheet widthwise of the drum and upon completion thereof slidably withdraw the sheet from engagement with said abutment, means for actuating said carrier comprising belt and pulley mechanism actuated from said sheet receiving means and adjustable belt tightener mechanism acting upon said belt to cause said carrier to maintain a predetermined uniform pressure between the stack and the abutment as sheets are successively withdrawn from the stack.

13. Sheet feeding mechanism for forwarding individual sheets in predetermined registry to a traveling sheet receiving and forwarding means comprising a feed drum having a longitudinally extending slot inclined to the axis of the drum and a cooperating roller having a complementary recess positioned to deliver the sheets to the sheet receiving means, an endless carrier for supporting a stack of sheets on edge in substantially upright forwardly inclined position with the upper edge of the sheet in proximity to said drum, an abutment engaging the lower end portion of the outermost sheet, means for deflecting an upper corner of the outermost sheet of said stack into engagement with the slot in said drum, whereby continued rotation of the drum will progressively continue the deflection of the sheet widthwise of the drum and upon completion thereof slidably withdraw the sheet from engagement with said abutment, means operable from said sheet receiving means for actuating said carrier to maintain a predetermined pressure between the lowermost sheet and the abutment as successive sheets are withdrawn from the stack, and means for adjusting said endless carrier up or down to position upper ends of stacks of sheets having different lengths properly with respect to said sheet forwarding drum.

14. Mechanism for successively separating sheets from a stack of sheets comprising means for supporting the stack of sheets with an edge portion thereof resting against a rotatable cylindrical drum having a continuous longitudinal groove in its periphery extending at an angle to the axis of the drum, and means for directing an edge portion of the outermost sheet into said groove whereby continued rotation of the drum will progressively separate said outermost sheet from the next adjacent sheet of the stack while otherwise retaining the sheets of the stack from displacement.

15. Mechanism for successively separating sheets from a stack of sheets comprising a feed drum having a longitudinally extending slot inclined to the axis of the drum, means for supporting the stack of sheets on edge in substantially upright forwardly inclined position with the upper edge portion thereof resting against said drum, and means for adjusting the stack-supporting means to vary the inclination of the stack, thereby to increase or decrease gravity pressure between the sheets of the stack.

16. Sheet feeding mechanism for forwarding individual sheets in predetermined registry to a traveling sheet receiving and forwarding means comprising a feed drum having a longitudinally extending slot inclined to the axis of the drum and a cooperating roller having a complementary recess positioned to deliver the sheets to the sheet receiving means, an endless carrier for supporting a stack of sheets on edge in substantially upright forwardly inclined position with the upper edge of the sheet in proximity to said drum, means pivotally suspending said carrier, and means for adjusting said suspending means to vary the inclination of said stack.

17. Sheet feeding mechanism comprising means for supporting a stack of sheets upon the lower edge thereof in upright forwardly inclined position including an abutment frictionally engaging the outermost sheet in proximity to the lower end thereof, means for deflecting an edge portion of the outermost sheet from the stack, means for progressively continuing the deflection of the edge of the sheet widthwise of the sheet

and bending the major portion of the sheet away from the next succeeding sheet of the stack to insure complete separation therefrom and having means operable thereafter slidably to withdraw the sheet from engagement with the abutment and forward the sheet to a sheet receiving means.

18. Sheet feeding mechanism comprising an endless carrier for supporting a stack of sheets upon the lower edge thereof in upright forwardly inclined position including an abutment frictionally engaging the outermost sheet in proximity to the lower edge thereof, means for deflecting a corner portion of the outermost sheet from the stack, means for continuing said deflection throughout the width of the stack and bending the major portion of the sheet away from the next succeeding sheet of the stack to insure complete separation therefrom and having means operable thereafter slidably to withdraw the sheet from engagement with the abutment and forward the sheet to a sheet receiving means, and means for actuating said movable carrier mechanism to move the stack forwardly as successive sheets are removed and to maintain substantially uniform frictional engagement between the then foremost sheet and said abutment.

19. Sheet feeding mechanism comprising movable carrier mechanism for supporting a stack of sheets upon the lower edge thereof in upright forwardly inclined position including an abutment frictionally engaging the outermost sheet in proximity to the lower end thereof, means for deflecting a corner portion of the outermost sheet from the stack, means for continuing said deflection throughout the width of the stack and bending the major portion of the sheet away from the next succeeding sheet of the stack to insure complete separation therefrom and having means operable thereafter slidably to withdraw the sheet from engagement with the abutment and forward the sheet to a sheet receiving means, means for adjusting said movable carrier mechanism upwardly or downwardly relatively to said deflecting and sheet forwarding means and means for actuating said movable carrier mechanism to move the stack forwardly as successive sheets are removed from the stack to maintain substantially uniform frictional engagement between the then foremost sheet and said abutment irrespective of the vertically adjusted position of the carrier mechanism.

20. Sheet feeding mechanism comprising means for supporting a stack of sheets, means located in proximity to an edge thereof having means to engage an edge portion of a sheet and thereafter to withdraw the sheet from the stack and forward the same, suction operated gripping means and means to actuate the same to engage the face of an edge portion of the outermost sheet of the stack and deflect it into the edge-engaging means of the sheet forwarding means, and adjustable suction controlling means selectively operable to cause suction to be applied to said gripping means in timed relation to the operation of said forwarding means, whereby long sheets or shorter sheets having a predetermined fractional length of said longer sheets may be separated from said stack and delivered by said forwarding means at the same rate of speed as that of said long sheets.

21. Sheet feeding mechanism comprising means for engaging and forwarding individual sheets, means for supporting a stack of sheets

with an edge thereof in proximity to said sheet forwarding means, suction operated means for deflecting an edge portion of the outermost sheet of said stack to said forwarding means in properly timed relation to the movements thereof, suction controlling means selectively operable to cause suction to be applied to said deflecting means in a predetermined ratio to the movements of said forwarding means to forward short sheets or for causing suction to be applied thereto in a different predetermined ratio to the movements of said forwarding means to forward longer sheets.

22. Sheet feeding mechanism comprising a rotatable feed drum having means to engage an edge of a sheet and a cooperating roller for advancing the sheet, means for supporting a stack of sheets with an edge thereof in proximity to said feed drum, suction actuated gripping means for deflecting the edge portion of the outermost sheet of a stack into engagement with said feed drum, and suction controlling means selectively operable to cause suction to be applied to said gripping means in synchronism with each revolution of the feed drum to forward sheets having a length not exceeding the circumference of the feed drum or in synchronism with ultimate revolutions of the feed drum to forward sheets having a length not exceeding twice the circumference of the feed drum.

23. Sheet feeding mechanism comprising a rotatable feed drum having means to engage an edge of a sheet and a cooperating roller for advancing the sheet, means for supporting a stack of sheets with an edge thereof in proximity to said feed drum, suction actuated gripping means for deflecting the edge portion of the outermost sheet of a stack into engagement with said feed drum, and suction controlling means selectively operable to cause suction to be applied to said gripping means upon every second revolution of the feed drum to feed sheets having a length not exceeding twice the circumference of the feed drum, or upon every fourth revolution of the feed drum to forward sheets having a length not exceeding four times the circumference of the feed drum.

24. A suction controller, for a machine having means for forwarding individual sheets from a stack, and suction actuated gripping means to engage an edge portion of the outermost sheet of the stack, and means for actuating said gripping means to deflect said edge portion of the sheet to the sheet forwarding means in synchronism with the movements of the sheet forwarding means, comprising a casing having a cylindrical recess and oppositely disposed channels having their ends communicating with said recess in proximity to each other, a conduit adapted to connect one of said channels to suction producing means and a conduit leading from the other channel to said gripping means, a valve rotatably mounted in the recess in said casing having a port adapted to establish communication between the adjacent ends of said channels twice during every revolution of said valve, means for rotating said valve in properly timed relation to the movements of said suction actuated gripping means, and means for closing one of said channels whereby suction will be applied once during each revolution of said valve.

25. A suction controller, for a machine having means for forwarding individual sheets from a stack, and suction actuated gripping means to engage an edge portion of the outermost sheet

of the stack, and means for actuating said gripping means to deflect said edge portion of the sheet to the sheet forwarding means in synchronism with the movements of the sheet forwarding means, comprising a casing having a cylindrical recess and oppositely disposed channels having their ends communicating with said recess in proximity to each other, a conduit adapted to connect one of said channels to suction producing means and a conduit leading from the other channel to said gripping means, an internally toothed ring gear valve rotatably mounted in the recess in said casing having a port adapted to establish communication between the adjacent ends of said channels twice during every revolution of said valve, a pinion in said casing engaging said ring gear valve having a predetermined ratio thereto, and means for rotating said pinion in properly timed relation to the movements of said suction actuated means, and means for closing one of said channels to vary the sequence of the application of suction to said gripping means.

26. A suction controller, for means for intermittently applying suction to the suction gripper of a sheet feeding machine comprising a casing having a cylindrical recess therein and oppositely disposed channels having their ends communicating with said recess in proximity to each other, means for connecting one of said channels to a suction producing means, means for connecting the other channel to the suction gripper, a rotatable valve mounted in said recess

having a port adapted to establish communication between adjacent ends of said channels twice during every revolution of said valve, and means selectively operable to close one of said channels thereby to establish communication between the suction means and the suction gripper once during each revolution of said valve.

27. A suction controller, for means for intermittently applying suction to the suction gripper of a sheet feeding machine comprising a casing having an integral body provided with a central cylindrical recess and oppositely disposed arcuate channels extending inwardly from one face of said body, said channels having their ends communicating with said recess in proximity to each other, means for connecting one of said channels to a suction producing means, means for connecting the other channel to said suction gripper, a rotary internally toothed ring gear valve mounted in said recess having a port adapted to establish communication between adjacent ends of said channels twice during every revolution of said valve, a cover plate secured to said body forming a closure for said cylindrical recess and said channels and forming an end bearing for said valve, a shaft mounted in said casing having a pinion engaging said ring gear valve, and manually operable means for closing one of said channels thereby to establish communication between said suction means and the suction gripper once during each revolution of the valve.

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