Jan. 1, 1935. F. L. CROSS 1,986,558

PAPER FEEDING MACHINE

Filed Aug. 18, 1933 2 Sheets-Sheet 1

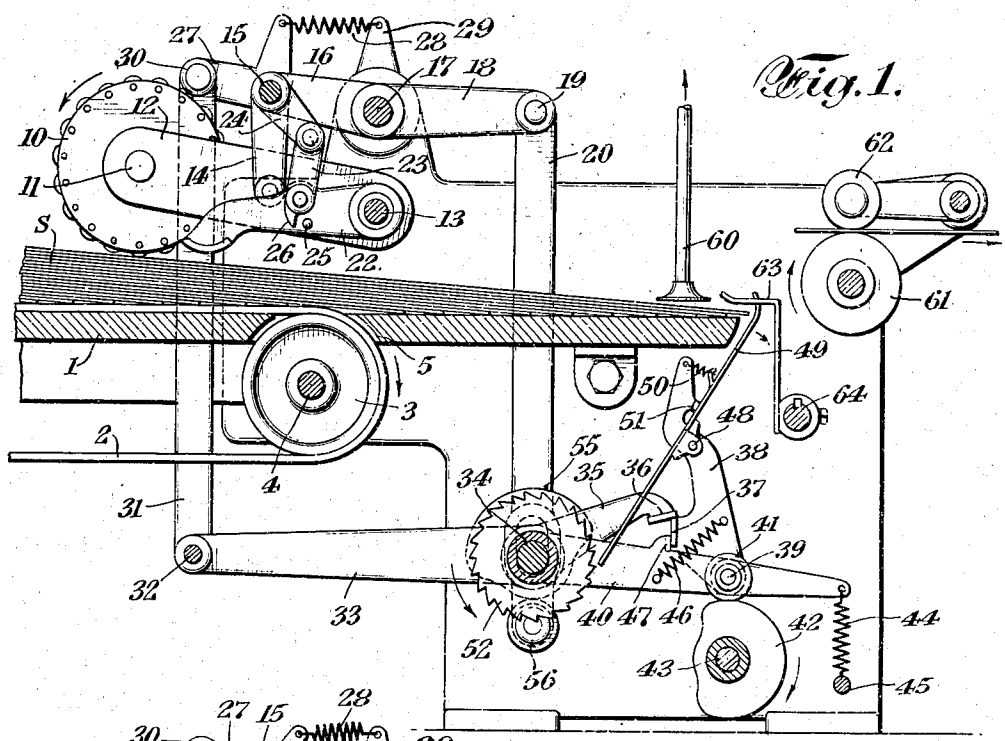


Fig. 1.

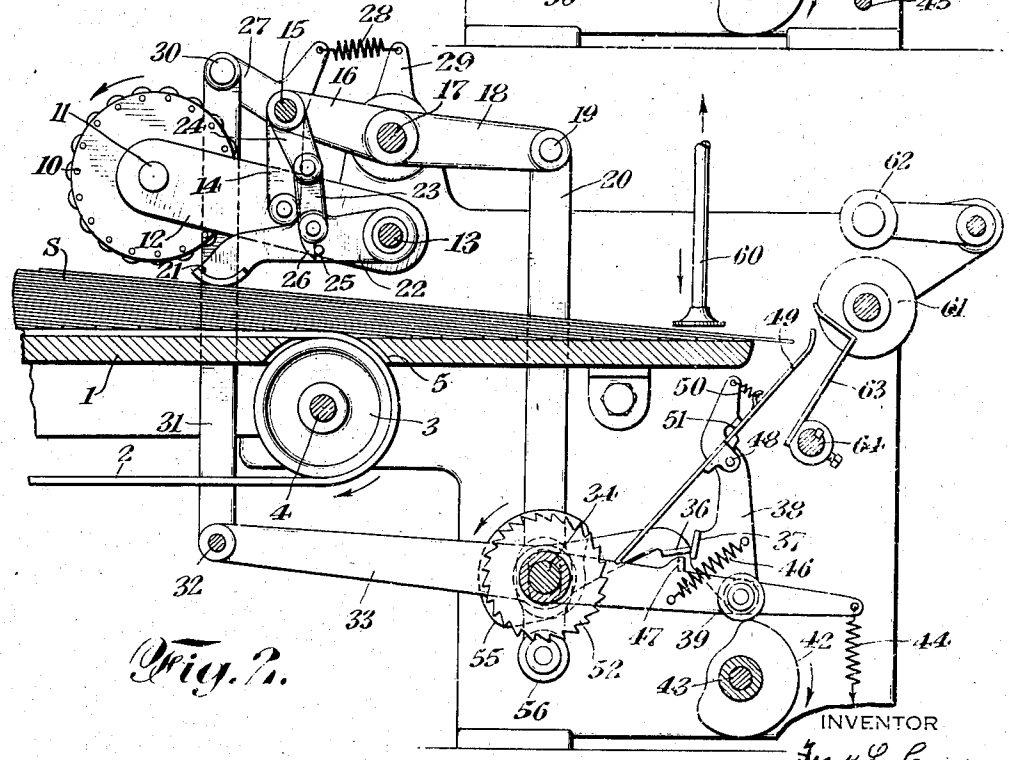


Fig. 2.

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Fig. 3.

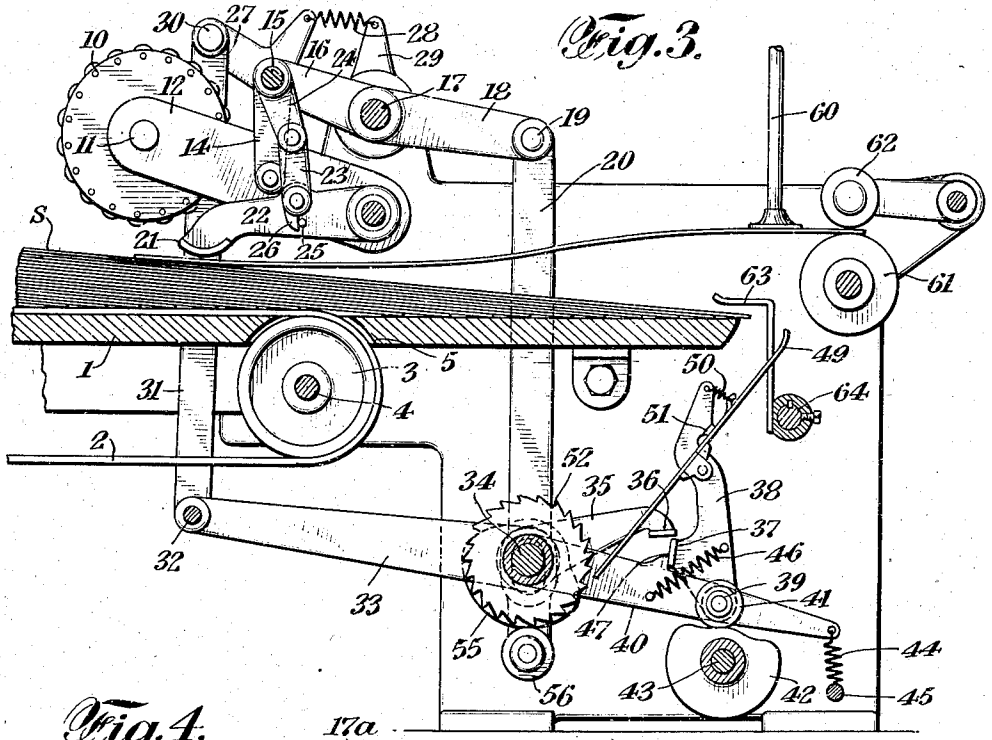
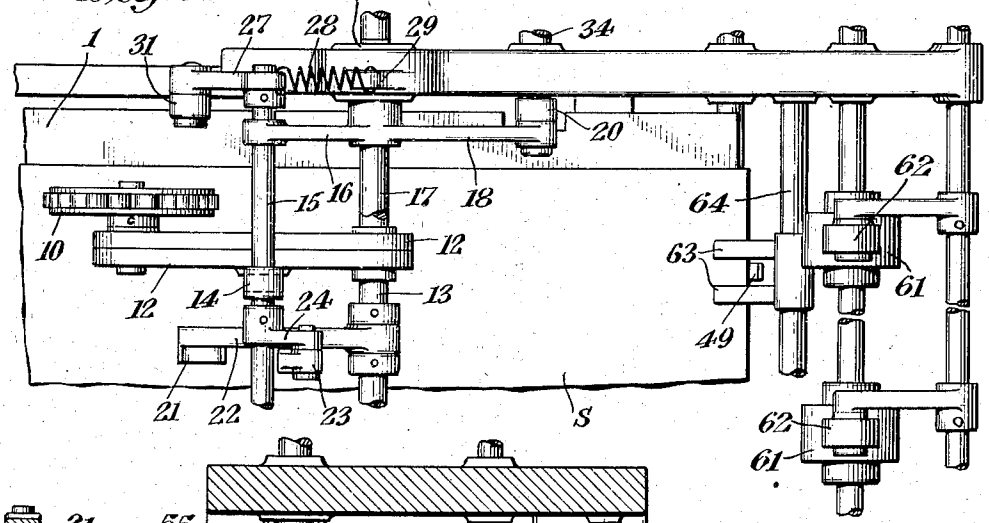


Fig. 4.



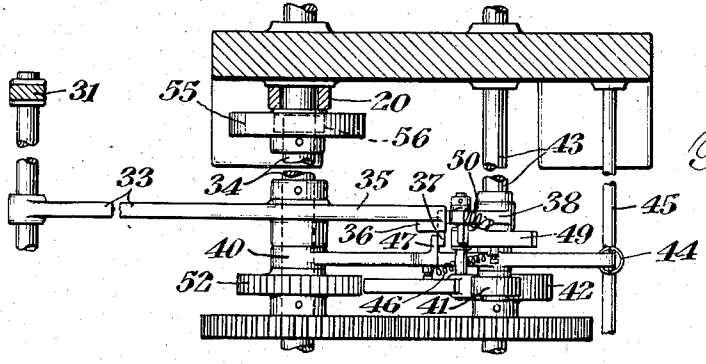


Fig. 5.

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Patented Jan. 1, 1935 1,986,558

UNITED STATES PATENT OFFICE

1,986,558

PAPER FEEDING MACHINE

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Application August 18, 1933, Serial No. 685,665

14 Claims. (Cl. 271—38)

The speed of operation of sheet-feeding machines is limited in a measure by the necessity of retaining the sheet-engaging working parts out of action during the whole or a major part of the time that sheets are passing from the machine.

The main purpose of the present invention is to reduce the idle time periods of the sheet-separating devices of feeding machines to thereby increase the speed of operation or output of the machine. To this end, the present invention comprises in its broadest aspect a rearrangement of the parts of a sheet-separating feeding machine by operating the seperating devices as far as practicable from the delivery edge of the feed table, and mounting the sheet-actuated cut-out or controlling devices beneath the feed table with the trip fingers movable away from the path of delivery of sheets, and delivery mechanism adapted to take the successive separated sheets, lift them away from the cut-out trip fingers, and remove them from the pile or bank in a plane higher than the plane of action of the separating devices. With this arrangement, the idle time between sheet-separating operations is reduced to a minimum. It is only necessary to hold the separating elements out of operation during the short time it takes the tail of the separated sheet to pass beneath the separating devices.

The specific forms of combing separators and sheet-actuated controlling devices may be variously modified within the scope of this invention, but such mechanisms are preferably reorganized parts of the commercially well-known Cross continuous paper feeding machine shown in U. S. Patent No. 812,260, dated February 13, 1906.

In order that the invention may be fully understood, it will first be described with reference to the accompanying drawings, and afterwards more particularly pointed out in the annexed claims.

In said drawings:—

Figure 1 is a vertical longitudinal sectional view of part of a continuous paper feeding machine embodying the present invention and representing one of a pair of sheet-controlled combing separating mechanisms in operative position upon a pile or bank of sheets.

Figure 2 is a similar view, representing the separating combing mechanism in tripped inoperative position.

Figure 3 is a similar view, representing the combing separating mechanism in a third position assumed during the feed-off or delivery of a sheet separated from the pile or bank.

Figure 4 is a detail plan view of the mechanism shown in Figure 1.

Figure 5 is a detail plan view of the separator cut-out or controlling mechanism arranged beneath the feed table.

In the continuous sheet-feeding machine of the type to which the present invention is preferably applied, a feathered bank of sheets, indicated at S, is supplied from a supply table (not shown) to a feed table, indicated at 1, over which pass a series of feed belts 2 operating around pulleys 3 upon a transverse shaft 4, the peripheries of pulleys 3 operating in suitable slots or recesses 5, through which the feed belts 2 pass. The continuous supply of sheets S to the feed table 1 may be by any of the well-known mechanisms, and forms no part of the present invention, which relates to the separation and delivery of sheets from the feathered bank upon the feed table.

In this type of feeding machine, it is common practice to employ two sets of combing separators, arranged in parallel vertical planes so as to effect a squaring of the sheet as it is separated and prepared for delivery. The machine embodying the present invention is intended to have two such sheet-registering, combing, separating mechanisms in accordance with the usual practice. In the illustrations in the accompanying drawings, only one of these duplicate mechanisms is shown.

10 is one of a pair of sheet-combing rollers of well-known form, freely journalled at 11 upon a hollow arm 12 pivoted upon a constantly rotating shaft 13, from which the comb wheel 10 is constantly driven by a train of gears mounted within arm 12 (not shown) in the usual manner.

The comber-supporting arm 12 is connected by a link 14 with a shaft 15 journalled in the ends of two arms 16 fixed upon a transverse shaft 17 suitably journalled in the machine frame at 17*a*, one of the arms 16 having a lever extension 18 beyond shaft 17, to which is pivotally connected at 19 the depending cam-operated link 20, hereinafter referred to.

A fulcrum foot 21 is formed on the end of an arm 22, freely journalled upon the shaft 13 and connected through the toggle links 23, 24 with the shaft 15, above referred to. A pin 25 upon fulcrum arm 22 is arranged in the path of a finger 26, projecting beyond the pivot of toggle link 23 for determining the limit of the straightened position of the toggle. The lower toggle

link 23 is freely pivoted upon fulcrum arm 22, while the upper toggle link 24 is keyed or otherwise rigidly secured upon the shaft 15 so that the toggle can be straightened by turning the shaft.

The shaft 15 also carries a bell crank lever 27, rigidly fixed upon the shaft and having connected to one arm an actuating spring 28 which is anchored to a rigid frame lug 29. As is usual with the Cross type of sheet-separating mechanism, this spring 28 tends to rotate shaft 15 and straighten the toggle 23, 24 for forcing the fulcrum foot 21 into engagement with the bank of sheets and thereby elevate the comb wheel 10 from the sheets, this operation being normally resisted by a control mechanism actuated by a sheet trip or cut-out in the manner now to be described.

Pivotally connected to the bell crank 27 at the point 30 is a depending link 31, which passes downwardly at one side of the feed table 1 and is pivoted at 32 to the end of a control lever 33 freely journalled upon a constantly rotating transverse shaft 34. This lever 33 is extended beyond the shaft 34 into a control arm 35 formed with a tappet finger 36 which, as shown in Figure 1 of the drawings, normally engages and is supported by the tappet finger 37 formed on a lever 38 freely pivoted at 39 upon a supporting resetting lever 40, which is in turn freely journalled upon the shaft 34 alongside of lever 33. Resetting lever 40 carries between its ends an anti-friction roller 41 engaging and supported by a controlling cam 42 upon a rotating controlling cam shaft 43. A spring 44 connects the end of lever 40 with a stationary bracket 45 to cause the lever to follow the controlling cam 42. A spring 46 connects the lever 38 with the control lever 40, retaining the tappet finger 37 normally in engagement with the stop shoulder 47 upon lever 40, this position of the parts also ensuring the engagement of the tappet 37 beneath the tappet finger 36.

Pivoted at 48 upon the lever 38 is a sheet-actuated trip finger or cut-out 49 engaged by a spring 50 to hold the trip finger normally against the stop lug 51 of lever 38, which in the normal position of parts, as shown in Figure 1 of the drawings, presents the upper end of the trip finger 49 at the end of the feed table 1 in the path of sheets which are being acted upon by the combing separator. In this same position the lower end of the trip finger 49 is presented adjacent to the toothed periphery of a ratchet wheel 52, secured to the constantly rotating shaft 34, above referred to. When the trip finger 49 is struck by the leading edge of a separated sheet, said finger is moved upon its pivot 48 to throw its lower end into engagement with a tooth of ratchet wheel 52, with the result that the thrust of the rotating ratchet 52 upon trip finger 49 forces the lever 38 away from shaft 34, removing tappet 37 from beneath tappet finger 36, (the pressure of spring 28 causing tappet 36 to engage finger 37 to force the lever 38 far enough away to disengage trip finger 49 from the ratchet) thereby freeing lever 33 and permitting spring 28 to rock shaft 15 from the position shown in Figure 1 to the position shown in Figure 2, and straighten the toggle links 23, 24, forcing the fulcrum foot 21 into engagement with the bank of sheets, and elevating the combing wheel 10 from the bank, thereby terminating the combing action.

The depending link 20, referred to above, is formed adjacent to its lower end with a guide loop, through which shaft 34 extends, said shaft carrying the timing controlling cam 55 operating upon an anti-friction roller 56, journalled in the lower end of the link 20. Immediately following the arresting of operation of the combing separator, as shown in Figure 2 of the drawings, this cam 55 comes into action for rocking the lever 18 and raising the shaft 15 which, through link 14 connection with the comber supporting arm and toggle link connection with the fulcrum arm 22, raises the combing separating mechanism entirely free of the bank of sheets, so that the feed-off and delivery mechanisms can remove the separated sheet without restraint.

After the delivery of a separated sheet, it becomes necessary to reset the combing separator and its sheet-actuated controlling mechanism. This resetting of the parts is accomplished by the control cam 42, first lowering the lever 40 from the position shown in Figure 2 into the position shown in Figure 3, placing the tappet 37 against the limit stop 47 and beneath the tappet finger 36, and then raising the lever 40, forcing the tappet arm 35 upwardly and the control lever 33 downwardly to rotate shaft 15, breaking the toggle 23, 24 and placing the spring 28 under normal strain, with the result that the comb wheel 10 will again be in operative engagement with the bank of sheets and the fulcrum foot 21 supported out of contact with the bank. This engagement of tappet 37 with tappet finger 36 in raised position, as shown in Figure 1, holds the parts in operative position during the next sheet-separating action.

The feed-off and delivery mechanisms are shown diagrammatically and consist preferably of suitable suction tubes indicated at 60 mounted upon a suitable carrier (not shown) and designed to suctionally grip the leading edge of a separated sheet and raise it from the table away from the cut-out controls and direct the leading edge of the sheet to suitable drop roller delivery mechanism indicated at 61, 62. The drop rollers controlled in the usual way engage the leading edge of the sheet and rapidly move the sheet from the feathered bank upon the feed table.

63 represents a sheet guide of angular formation mounted upon a rock shaft 64 and controlled at the same time with the drop roller delivery mechanism just referred to, said sheet guides serving to confine the leading edge of the sheet adjacent to the trip fingers 49. This operation will be clear without further illustration or explanation.

It will be observed that the feed-off and delivery mechanism move the leading edge of the sheet upwardly away from the cut-out trip fingers 49 and sheet guide 63, said parts being in the position shown in Figure 2 of the drawings when this delivery operation takes place. Following each delivery of a separated sheet, the combing separators and sheet-actuated controlling devices are returned to normal position ready for the next sheet-separating operation. The trip fingers 49 can be moved back into their operative position a moment after the feed-off devices 60 raise the leading edge of the separated sheet from the table, but since the trips are reset by the same mechanism that throws the combing separating device into action, the action of said resetting mechanism (cam 42 and controlled parts) is timed to return the parts to normal operative position a moment after the tail of the separated sheet passes beneath the comber 10 and fulcrum foot 21. Thus, the timing of the periodic operation of the combing separating devices is dependent mainly upon the rapidity of operation of the feed-off and delivery devices, the combers remaining in

operation just long enough to separate a sheet and move it into engagement with the trip fingers, and remaining out of operation just long enough to permit the separated sheet to be drawn from beneath the combers.

I claim:—

1. In a sheet feeding machine, the combination with a feed table, of a sheet-combing separator operating above and movable toward and away from said table an appreciable space from the delivery end thereof, suitable feed-off means operating above the delivery end of said table, and a sheet-actuated comber cut-out trip finger movably mounted beneath said table and projecting above the delivery end thereof.

2. In a sheet feeding machine, the combination with a feed table, of a sheet-separator operating above and movable toward and away from said table, suitable feed-off means operating above the delivery end of said table, and a sheet-actuated cut-out trip finger movably mounted beneath said table and projecting above the delivery end thereof, said feed-off means being movable upwardly from the plane of said feed table to permit the return of said trip finger to its active position while a separated sheet is being fed off.

3. In a sheet feeding machine, the combination with a feed table, of a sheet-combing separator operating above and movable toward and away from said table an appreciable space from the delivery end thereof, suitable feed-off means operating above the delivery end of said table, and a sheet-actuated comber cut-out trip finger movably mounted beneath said table and projecting above the delivery end thereof, said feed-off means being movable away from the plane of said feed table to permit the return of said trip to its active position while a separated sheet is being fed off.

4. In a sheet feeding machine, the combination with a feed table, of a sheet-combing separator operating above and movable toward and away from said table, delivery mechanism operating adjacent to the delivery end of said feed table in a higher plane than said table, feed-off means operating adjacent to the delivery end of said feed table for transferring the leading ends of sheets from said table to said delivery mechanism, and a sheet-actuated comber cut-out trip movably mounted beneath said feed table and projecting across the plane of the table at the delivery end thereof.

5. In a sheet feeding machine, the combination with a feed table, and a sheet-combing separator operating above said table, of mechanism for lifting the separator from the sheets upon said table, a latch adapted to hold said lifting mechanism out of action, latch tripping means including a sheet-actuated trip-finger connected with said latch beneath said table and projecting above the delivery end thereof, and suitable feed-off means operating above the delivery end of said table and movable away from the plane thereof to permit the return of said trip-finger to its active position while a separated sheet is being fed off.

6. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, and a sheet-actuated trip adapted to disengage said latch from said controlling lever to permit said spring device to arrest the operation of the feeding mechanism.

7. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, a resetting lever upon which said latch is pivotally mounted, and a sheet-actuated trip adapted to disengage said latch from said controlling lever to permit said spring device to arrest the operation of the feeding mechanism.

8. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, a cam-operated resetting lever upon which said latch is pivotally mounted, a stop upon said resetting lever limiting the movement of said latch thereon, a spring connecting said latch with said resetting lever and retaining said latch normally in engagement with said stop, and a sheet-actuated trip adapted to disengage said latch from said controlling lever to permit said spring device to arrest the operation of the feeding mechanism.

9. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, a resetting lever upon which said latch is pivotally mounted, a sheet-actuated combined trip and dog pivotally mounted upon said latch, a power-driven ratchet with which said dog is adapted to engage to disengage said latch from said controlling lever, and a tappet member upon said controlling lever adapted to engage said latch and augment its movement away from said controlling lever and disengage said dog from said ratchet.

10. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, a cam-operated resetting lever upon which said latch is pivotally

mounted, a stop upon said resetting lever limiting the movement of said latch thereon, a spring connecting said latch with said resetting lever and retaining said latch normally in engagement with said stop, a sheet-actuated combined trip and dog pivotally mounted upon said latch, a power-driven ratchet with which said dog is adapted to engage to disengage said latch from said controlling lever, and a tappet member upon said controlling lever adapted to engage said latch and augment its movement away from said controlling lever and disengage said dog from said ratchet.

11. In a sheet feeding machine, the combination with a feed table, and sheet feeding mechanism operating above said table, of means for moving said feeding mechanism toward and away from said feed table, and automatic sheet-actuated means for holding said feeding mechanism in operative position above the pile, said automatic means comprising a spring device tending to move said feeding mechanism into inoperative position, a controlling lever restraining said spring device, a latch engaging and restraining said controlling lever, a resetting lever upon which said latch is pivotally mounted, a sheet-actuated combined trip and dog pivotally mounted upon said latch, a power-driven ratchet with which said dog is adapted to engage to disengage said latch from said controlling lever, and a cam acting upon said resetting lever to force said latch upwardly against said controlling lever and reset the spring device and initiate the operation of the feeding mechanism.

12. In a sheet feeder, the combination with a feed table, feeding mechanism operating above said table, and feeder controlling mechanism, of sheet-actuated cut-out trips mounted beneath said table and movable into and out of position to intersect the path of sheets, and feed-off mechanism adapted to deflect the delivery of sheets above the plane of the feed table, whereby said trip fingers can be returned to operative relation to said feed table during the delivery of a sheet.

13. In a sheet feeder, the combination with a feed table, feeding mechanism operating above said table, and feeder controlling mechanism, of sheet-actuated cut-out trips mounted beneath said table and movable into and out of position to intersect the path of sheets, operative connections between said feeder controlling mechanism and said trips, and feed-off mechanism adapted to deflect the delivery of sheets above the plane of the feed table, whereby said trip fingers can be returned to operative relation to said feed table during the delivery of a sheet.

14. A sheet feeding machine comprising a feed table arranged to support a bank of sheets, automatically controlled sheet separating combers acting upon sheets upon said table an appreciable space from the delivery end thereof, mechanism for raising said combers from the sheets upon said table, sheet actuated comber cut-out trip fingers mounted beneath said table and projecting above the delivery end thereof, said trip fingers controlling said comber raising mechanism, and suitable feed-off means operating above the delivery end of said table and movable away from the plane thereof to permit the return of said trip fingers to active position while the separated sheet is being fed off, whereby the inactive periods of said combers are reduced to a minimum.

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