

June 10, 1958

L. C. WILLIAMS

2,838,306

SHEET FEEDING APPARATUS

Filed Aug. 27, 1954

2 Sheets-Sheet 1

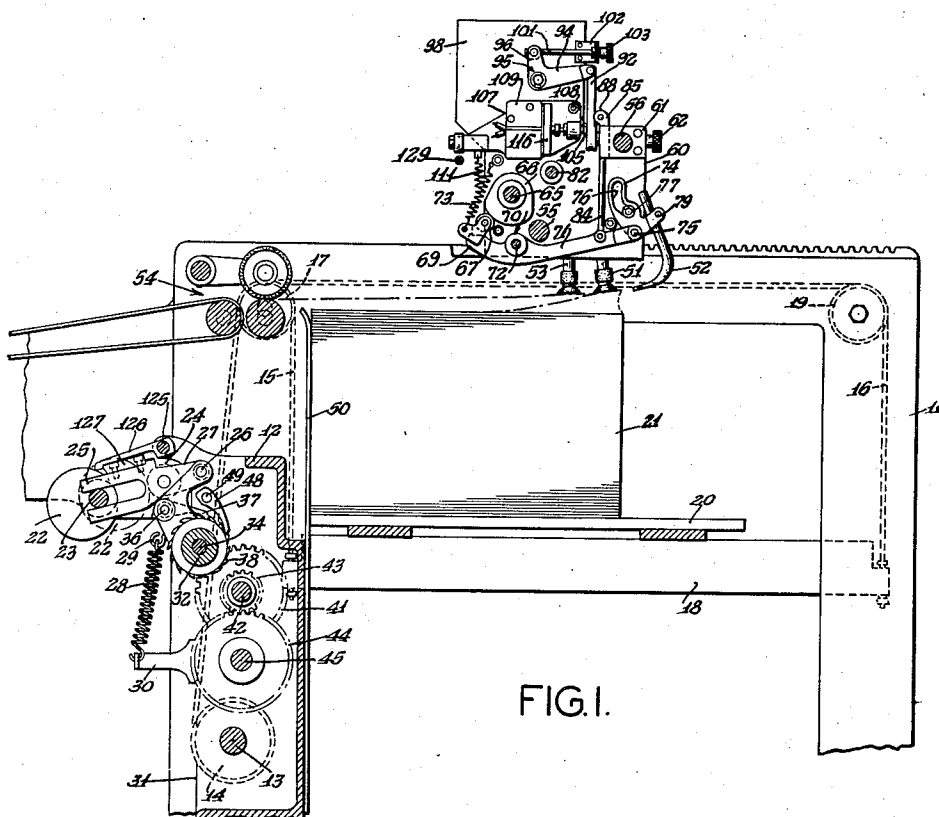


FIG. 1.

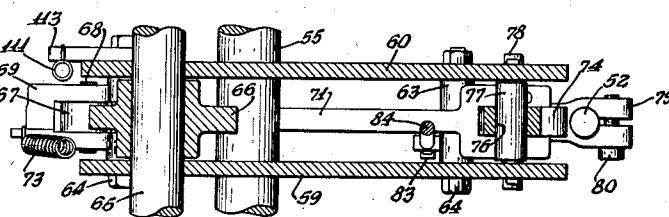


FIG. 4.

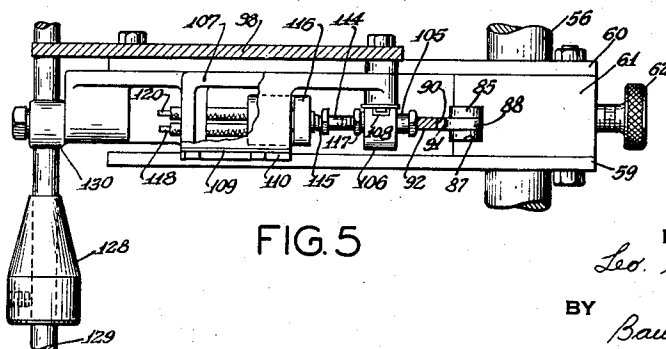


FIG. 5

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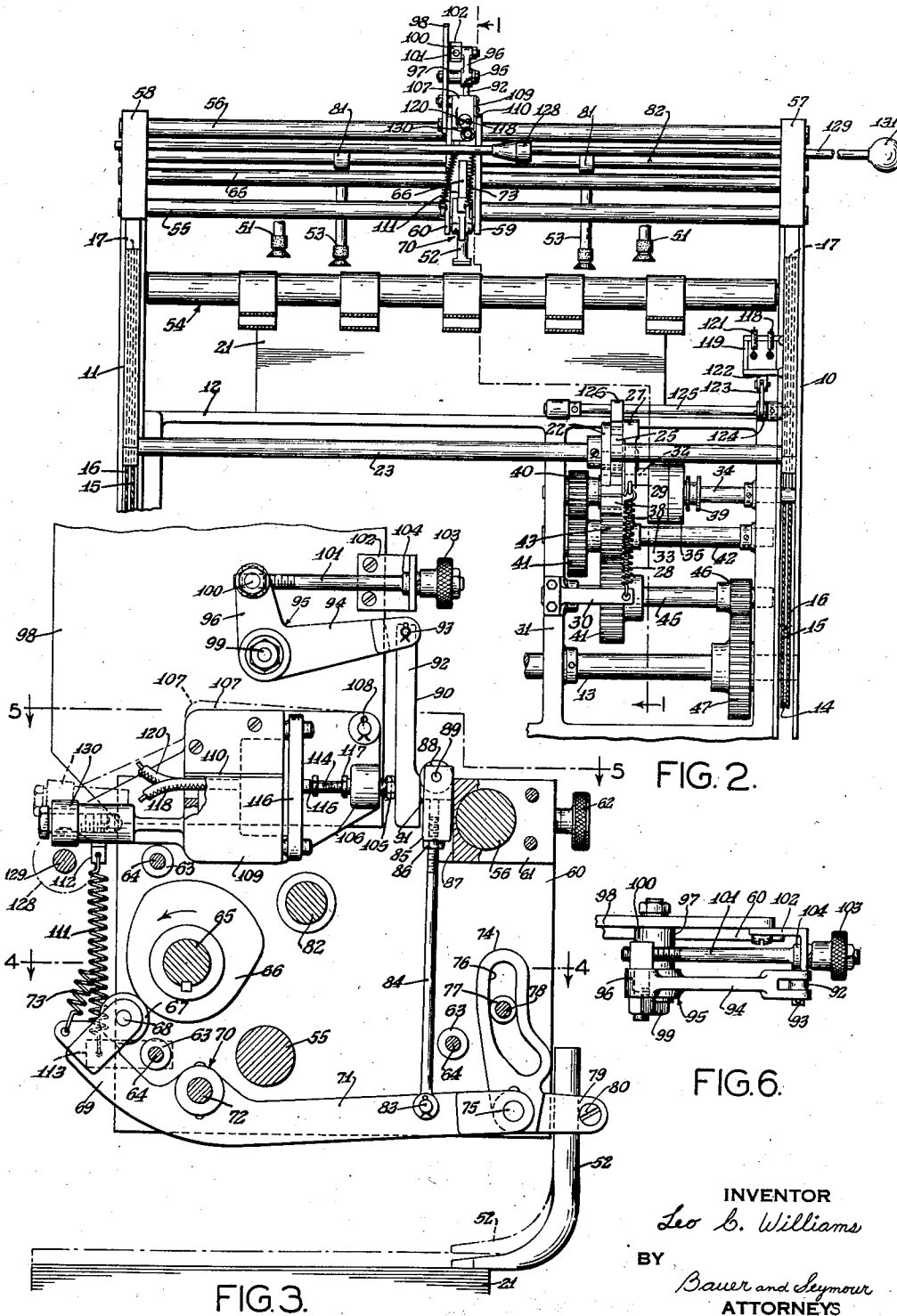
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2 Sheets-Sheet 2



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SHEET FEEDING APPARATUS

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Application August 27, 1954, Serial No. 452,505

5 Claims. (Cl. 271—31)

This invention relates generally to sheet feeding apparatus and more particularly to pile or sheet supply elevating or moving mechanism and control means therefor.

One object of the present invention is to provide in a sheet feeder improved and simplified means of smooth and reliable action for controlling the operation of the pile or sheet supply elevating or moving mechanism of said feeder.

Another object of the invention is to provide in a sheet feeder improved and more compact mechanism for rendering the pile or sheet supply elevating or moving mechanism of said feeder intermittently effective.

Another object is to provide improved mechanism of the character and for the purpose above described, which is so constructed that all of the elements thereof including the pile or sheet supply height testing member or feeler are closely associated as a single unit, thus insuring accurate operation of said mechanism and control of the pile or sheet supply elevating or moving means, and enabling use of said mechanism singly or in duplicate for different size sheet feeders.

Another object is to provide in a sheet feeder improved mechanism for controlling the operation of the pile or sheet supply elevating or moving means, which may be readily adjusted while the feeder is in operation to vary the feeding-in position of the pile or sheet supply, and which may be readily thrown out of operation to temporarily discontinue or prevent undesired or unnecessary operation thereof at certain times, as when loading and reloading the feeder, when handling certain kinds of stock, and when testing or adjusting the various operating parts of the feeder or the machine with which the feeder is associated.

A further object is to provide improved control mechanism for the purpose above described, wherein the usual foot clamp for holding the second sheet on the pile or supply against movement forms a part thereof and is advantageously utilized as the pile or sheet supply height testing member or feeler.

Another object is to provide in a sheet feeder improved mechanism for controlling the operation of the pile or sheet supply elevating or moving means, wherein the parts thereof are relatively few in number and small in size, and each part is simple in design and is easy and relatively inexpensive to manufacture.

The above and further objects and novel features of the present invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a vertical longitudinal sectional view of a sheet feeder of the suspended pile elevator type embodying pile elevator control means constructed and arranged

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in accordance with the present invention, said view being taken substantially on the irregular line 1—1 of Fig. 2, and showing the pile height testing foot clamp in its raised inoperative position;

Fig. 2 is a front elevational view of said sheet feeder looking from the left of Fig. 1, with parts omitted for purposes of clearer illustration;

Fig. 3 is an enlarged detail side elevational view, partly in section, of the pile elevator control means shown in Figs. 1 and 2, showing the pile height testing foot clamp in its lowered operative pile engaging position, certain of the parts having portions thereof broken away for purposes of clearer illustration;

Fig. 4 is a horizontal sectional view taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal sectional view taken substantially on the line 5—5 of Fig. 3, certain of the parts having portions thereof broken away for purposes of clearer illustration; and

Fig. 6 is a detail top plan view of the structure shown in Fig. 3 for supporting and adjusting the elevator control member or cam.

Referring to the drawings, the present invention is herein illustrated, by way of example, as being embodied in a sheet feeder of the pile elevator type so as to control the operation of the pile elevator and raising of the pile of sheets thereon whereby the top of said pile is maintained at a predetermined level for feeding of sheets one after another successively therefrom. It will be understood that the present invention may, without modification, also be embodied in a "continuous" type of sheet feeder to control the movement of the supply of sheets which is in the form of a fanned-out bank of sheets.

With reference to the drawings, particularly Figs. 1 and 2 thereof, 10 and 11 indicate the main side frames of a sheet feeder on which are mounted the various movable parts of said feeder, as well as certain stationary parts thereof. The frames 10, 11 are connected together by a front apron or plate 12 bolted or otherwise suitably secured to said frames. Extending transversely of the feeder and journaled in suitable bearings in the frames 10, 11 and in the apron 12 is a shaft 13 having fixed thereon at opposite ends thereof cable winding drums 14. Anchored to each drum 14 are corresponding ends of two cables 15 and 16 which extend upwardly therefrom. The cables 15, 16 at one side of the feeder, and the corresponding cables at the opposite side of the feeder pass over sheaves 17 journaled on the frames 10 and 11. From the sheaves 17 the cables 15 extend downwardly and have their lower free ends connected to the front ends of pile elevator side bars 18. From the sheaves 17 the cables 16 extend rearwardly and pass over and around sheaves 19 and then downwardly and have their lower free ends connected to the rear ends of the side bars 18. The sheaves 19 are journaled on the frames 10, 11, and the side bars 18 at opposite sides of the feeder serve to receive and support a pile board 20 and pile of sheets 21 on said board.

The shaft 13 is operated at suitable intervals to raise the pile elevator comprising the cables 15 and 16 and side bars 18, and said operation of said shaft is effected, in the illustrated embodiment, by pawl and ratchet mechanism comprising a cam 22 (Figs. 1 and 2) fixed on a transversely extending shaft 23 which is journaled in suitable bearings in the frames 10 and 11. The shaft 23 is driven from any suitable source of power to make one or more revolutions for each cycle of operation of the feeder. The cam 22 engages a roller 24 journaled on a cam strap 25 extending over the shaft 23 and pivotally connected, as at 26, with a pawl carrier 27. The roller 24 is biased toward cam 22 by a coil extension spring 28 having one end thereof connected at 29 with

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the pawl carrier 27. The opposite end of spring 28 is connected to an arm 30 which is secured to or formed integrally with a bracket 31 which is, in turn, secured to or formed integrally with the apron 12.

The pawl carrier 27 is mounted for oscillating movement on the hub 32 (Figs. 1 and 2) of a clutch part 33 which is loosely mounted on a short transverse shaft 34 and cooperates with another clutch part 35 that is fixed on said shaft. The shaft 34 is journaled in suitable bearings in the frame 10, apron 12 and bracket 31. Pivoted, as at 36, on the pawl carrier 27 is a pawl 37 which is adapted to continuously engage the teeth of a ratchet 38 that is fixed on the hub 32 of clutch part 33. The clutch comprising the parts 33 and 35 is of well-known construction and is utilized so as to enable disconnecting of the pawl and ratchet drive from the shaft 34 and rotation of said shaft by separate means (not shown) to rapidly raise and lower the pile elevator for pile loading and reloading purposes, as well understood in the art. The clutch parts 33 and 35 are normally engaged to provide for rotation of the shaft 34 by the pawl and ratchet mechanism, and said clutch parts may be engaged and disengaged by a device 39 which is loosely and slidably mounted on the shaft 34 and may be actuated in any suitable manner and by any suitable means operatively connected therewith.

Fixed on the shaft 34 adjacent the ratchet 38 is a small spur gear 40 (Fig. 2) which meshes with and drives a larger spur gear 41 (Figs. 1 and 2) that is fixed on a short transverse shaft 42 journaled in suitable bearings in the apron 12 and in the bracket 31. Fixed on and driven by the shaft 42 is a small spur gear 43 which meshes with and drives a larger spur gear 44 that is fixed on a short transverse shaft 45 journaled in suitable bearings in the apron 12 and the bracket 31. Fixed on and driven by the shaft 45 is a small spur gear 46 which meshes with and drives a larger spur gear 47 that is fixed on and drives the hereinbefore described drum shaft 13. The bracket 31 provides an additional support and bearing for the shaft 13. It will thus appear that through oscillation of the pawl carrier 27 by the cam 22 and the spring 28 and engagement of the oscillating pawl 37 with the ratchet 38, the shaft 13 and drums 14 thereon will be intermittently rotated in the proper direction, through the described gearing for said shaft with the shaft 34, to wind the cables 15 and 16 on said drums, thus imparting step by step upward movement to the pile elevator and pile of sheets 21 thereon. A retaining pawl 48 pivoted at 49 on the bracket 31 is engaged with the ratchet 38 to hold the latter and the shaft 34 in actuated positions and against return movement as the pawl carrier 27 is returned to enable the pawl 37 to engage another tooth on said ratchet. During upward movement of the pile elevator the front edge of the pile of sheets 21 is guided by spaced vertical guides 50 which are suitably supported on the apron 12.

As herein shown and customary in many sheet feeders, the sheets are separated and lifted one after another from the top of the pile 21 by suction devices 51 (Figs. 1 and 2) which may be of any suitable construction and which are adapted to engage opposite rear corner portions of each successive sheet and lift the rear edge thereof above the level of the pile, as shown in broken lines in Fig. 1. Vacuum is created and broken in the suction devices 51 at predetermined intervals to grip and release each sheet, and for this purpose said devices are customarily connected with a suitable valve mechanism (not shown) which, in turn, is connected with a vacuum pump (not shown) or other suitable source of vacuum. After each sheet is separated and lifted from the pile 21 by the suction devices 51 and prior to release of said sheet by said devices, one or more foot clamps 52 are moved under the sheet and into engagement with the top of the pile, air blasts are directed forwardly under the lifted sheet through blow pipes (not shown), and said

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sheet is gripped at spaced points across the rear edge thereof by suction devices 53 which function to forward the sheet, when released by the suction devices 51, from the pile and deliver the same to conveyor means indicated generally at 54. The air blasts referred to above and directed under the separated and lifted sheet act to completely separate said sheet from the pile and to float said sheet forwardly under the control of the suction sheet forwarding devices 53, and the foot clamp or clamps 52 serve to hold the underlying sheet against displacement while the topmost separated and lifted sheet is being winded and forwarded.

In large size sheet feeders handling large sheets, at least two of the foot clamps 52 are usually employed, and in smaller size sheet feeders, as herein illustrated, handling sheets of less width, one only of said foot clamps is deemed sufficient and is located at the rear and substantially in the center of the pile of sheets 21. As herein shown, the foot clamp 52 is designed as a separate adjustable unit, thus two of said units may be employed as desired or required, and located at spaced points across the rear of the pile of sheets without necessitating any change in the feeder structure. The foot clamp unit is mounted on an auxiliary frame which also carries the suction sheet separating and lifting devices 51, the suction sheet forwarding devices 53, and the sheet winding blow pipes, said frame comprising two parallel cross shafts 55 and 56 which are secured at their opposite ends in end-brackets 57 and 58 which, in turn, are supported on and movable along the tops of the frames 10 and 11, respectively, to enable longitudinal adjustment of said foot clamp unit, said suction devices and said blow pipes to accommodate sheets of different lengths.

The single centrally located foot clamp unit herein shown comprises two vertically extending spaced parallel side plates 59 and 60 (Figs. 2, 4 and 5) which are slidably mounted on the cross shafts 55, 56 and are bolted or otherwise suitably secured at their upper rear corners to opposite sides of a spacer-block 61. The cross shaft 55 extends through suitable axially aligned clearance openings in the side plates 59, 60, and the cross shaft 56 extends through suitable axially aligned clearance openings in said plates and in the spacer-block 61. The side plates 59, 60 are releasably secured against axial movement relative to the cross shafts 55, 56 by a jam screw 62 threaded in the spacer-block 61 and engaging the cross shaft 56. Other spacers 63 and bolts 64 located adjacent the upper front corners and the lower opposite corners of the side plates 59, 60 serve to further hold said plates firmly together in spaced parallel relation.

Extending transversely of the feeder through the side plates 59, 60 and journaled in suitable bearings in said plates and in the end-brackets 57, 58 is a cam shaft 65 (Figs. 1 to 4) which is driven from any suitable source of power, for example, the printing press or other machine with which the feeder is associated, to make one revolution for each cycle of operation of said feeder and in timed relation with said press or machine. Disposed between the side plates 59, 60 and slidably keyed to the shaft 65 is a cam 66 the hub of which spans the distance between said plates so as to prevent relative sideways movement of said cam. The cam 66 engages a cam follower roller 67 which is journaled on a pin 68 that is suitably secured in the short arm 69 of a double-armed lever 70 the other longer arm of which is indicated at 71. This lever 70 is disposed between the side plates 59, 60 and is pinned or otherwise suitably secured to a stud 72 which is journaled in suitable bearings provided in said side plates. The hub of the lever 70 spans the distance between the side plates 59, 60 so that said lever is held against sideways movement with respect to said plates. The follower roller 67 is biased toward the cam 66 by a coil extension spring 73 having one end thereof connected to the lever arm 69 and the opposite end connected to the side plate 59. The cam 66 being fixed on

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the shaft 65 rotates continuously and, hence, the lever 70 will, during each cycle of operation of the feeder, be positively rocked about the pivot 72 by said cam in the direction to raise the arm 71 thereof to the position shown in Fig. 1, and will be yieldingly rocked by the action of the spring 73 in the opposite direction to lower said arm.

The free end of the arm 71 of the lever 70 is bifurcated to receive and confine a cam link 74 (Figs. 1, 3 and 4) which is pinned or otherwise suitably secured to a pin 75 that is journaled in suitable bearings in said arm. The cam link 74 is provided with a closed cam slot 76 into which extends a roller 77 that spans the distance between the side plates 59, 60 and is journaled on a pin 78 loosely carried by said plates. The cam link 74 is formed with a clamp 79 in which is secured for vertical adjustment, as by a clamp screw 80, the hereinbefore described foot clamp 52 which is so formed that it extends downwardly and forwardly from said clamp.

It will thus appear that through rocking movement of the lever 70 by the spring 73 and the cam 66, and the action of the cam slot 76 in the cam link 74, said cam link will be moved downwardly and rocked rearwardly, and moved upwardly and rocked forwardly once during each cycle of operation of the feeder. This results in a downward forward movement and a backward upward movement of the foot clamp 52. The described downward forward movement of the foot clamp 52 is so timed that it occurs after the top sheet is separated and lifted at the rear thereof from the pile 21 by the suction devices 51, with the result that said foot clamp is yieldingly engaged with and exerts a clamping action on the top of said pile beneath the separated and lifted sheet, thus preventing displacement of any underlying sheets while the separated and lifted sheet is being forwarded from the pile by the suction devices 53. Since the foot clamp 52 is engaged with the top of the pile once during each feeding cycle and such engagement occurs at the existing level of said pile, said foot clamp is also utilized advantageously as a pile height testing member or feeler to control the operation of the pile elevator in a manner to be hereinafter described.

The suction sheet forwarding devices 53 may be of any suitable construction and are carried in blocks 81 (Fig. 2) fixed on a rock shaft 82 which extends transversely of the feeder through suitable clearance openings in the side plates 59, 60 and is journaled in suitable bearings in the end-brackets 57, 58. The shaft 82 is actuated from the cam shaft 65 by suitable connections (not shown) to swing the suction devices 53 rearwardly to engage the separated and lifted sheet, and then forwardly to forward the engaged sheet from the pile. Vacuum is created and broken at predetermined intervals in the suction devices 53 to cause the latter to grip and release each separated and forwarded sheet, and for this purpose said devices are connected with a suitable valve mechanism (not shown).

The conveying means 54 is of conventional construction and is driven by any suitable mechanism either at slow speed to enable lapping of the sheets thereon and to advance a stream of the lapped sheets to the printing press or other machine, or at fast speed to advance the sheets singly in spaced relation to said press or machine, as well understood in the art. Upon delivery of each sheet to the conveying means 54 by the suction devices 53, vacuum is broken in said devices to release said sheet, whereupon said devices are swung rearwardly to engage the next previously separated and lifted sheet.

As the sheets are fed off the top of the pile 21 by the described sheet separating and forwarding devices, the elevator and pile of sheets thereon are raised intermittently by the described pawl and ratchet mechanism, and to keep the top of the pile at a predetermined level for action thereon by the sheet separating and forwarding devices the elevator and its intermittently actuated

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operating mechanism are, in accordance with the present invention, controlled by improved, simplified and compact means, including the foot clamp 52, preferably constructed, mounted and operated as follows. The arm 71 of the lever 70 has pivotally connected thereto, as at 83, the lower end of a vertically disposed rod 84 (Figs. 3 and 4). The rod 84 is provided on the upper end thereof with a head or block 85 which is preferably, but not necessarily, square in horizontal cross section. The head 85 is adjustably threaded on the rod 84 and is held in adjusted position and against relative rotation by a lock nut 86 threaded on said rod and engaging against said head. The head 85 is slidably engaged in a channel or guideway 87 formed in the front face of the spacer-block 61, said channel or guideway serving to confine and guide said head for vertical up and down movement in a substantially straight line. The head 85 is bifurcated at the upper end thereof to receive a roller 88 which is journaled on a pin 89 secured in any suitable manner in said head. It will thus appear that when the foot clamp 52 is moved by the lever 70 toward and away from the pile 21 into and out of engagement with the top of said pile, the roller 88 is simultaneously moved downwardly and upwardly by said lever through the rod 84 and head 85.

The described roller 88 on the head 85 is adapted, under certain conditions, to engage straight low and high cam surfaces 90 and 91, respectively (Figs. 3 and 5), which are formed on the rear edge of a straight vertically disposed cam bar 92, the low cam surface 90 being above the high cam surface 91 and terminating at said high cam surface in a small radius so that the roller 88 will pass substantially directly from said low cam surface to said high cam surface and vice versa. The cam bar 92 constitutes the controlling member for the pile elevator operating mechanism and is pivotally mounted at the upper end thereof at 93 on one arm 94 of a bell-crank lever 95 the other arm of which extends upwardly and is indicated at 96 (Figs. 3 and 6). The bell-crank lever 95 is pivotally mounted on the reduced end of a spacer-stud 97 which is secured to a plate 98 by a bolt 99, said bolt also serving to retain said lever on said stud. The plate 98 is bolted or otherwise suitably secured to the side plate 60 exteriorly thereof and provides an upward extension of said side plate. Disposed between the extension plate 98 and the bell-crank lever 95 and rotatably carried by the arm 96 of said lever is a block-stud 100 in which is threaded one end of an adjusting screw 101. The opposite end of the adjusting screw 101 projects through a suitable clearance opening in an angle bracket 102 and has suitably secured thereto a head or knob 103 for rotating said screw. Axial movement of the adjusting screw 101 is prevented in one direction by the head 103 and in the opposite direction by a shoulder 104 on said screw, said head and shoulder engaging against opposite faces of the angle bracket 102. The angle bracket 102 is bolted or otherwise suitably secured to the extension plate 98.

The controlling member or cam bar 92 engages one end of a horizontally disposed plunger pin 105 (Figs. 3 and 5) which is slidably mounted in a boss 106 formed on a box-like bracket 107. This bracket 107 projects between the side plates 59, 60 and is pivotally mounted, for a purpose to be hereinafter described, at the upper rear corner thereof on a horizontal transversely extending pin 108 secured in the extension plate 98. The bracket 107 has removably secured thereto a cover plate 109 which is formed with a horizontal longitudinally extending bead or rib 110 that projects outwardly therefrom and normally engages the upper edge of the adjacent side plate 59. Engagement of the bead 110 with the side plate 59 holds the bracket 107 against downward swinging movement about the pin 108 and locates said bracket in its normal operative full line position shown in Fig. 3 so that the plunger pin 105 is disposed in the path of

forward swinging movement of the cam bar 92 for actuation thereby. The bracket 107 is biased downwardly toward the side plates 59, 69 by a coil extension spring 111 having one end thereof connected, as at 112, to said bracket and the opposite end connected, as at 113, to the side plate 69.

The plunger pin 105 has adjustably threaded therein a screw 114 (Figs. 3 and 5) the head of which engages the plunger 115 of a normally open electrical switch 116 which is suitably secured to the bracket 107 and is partly disposed beneath the cover plate 109. The screw 114 is adjusted so that the head thereof just contacts the plunger 115 when the roller 88 is in engagement with the low part 90 of the cam bar 92, as shown in Fig. 1. The screw 114 is held in adjusted position by a lock nut 117. The switch 116 is of the conventional micro type having contacts therein which require a movement of only a few thousandths of an inch in making and breaking contact. The switch 116 is electrically connected by a lead wire 118 with a solenoid 119 (Fig. 2), and said switch and said solenoid are electrically connected by lead wires 120 and 121, respectively, with a suitable source of electrical current. The solenoid 119 is secured in any suitable manner to the side frame 10. It will thus be apparent that when the plunger 115 is actuated by the cam bar 92 to close the switch 116, the electrical circuit for the solenoid 119 will be completed through said switch and the lead wire 118 and, hence, said solenoid will be energized. When the plunger 115 is released by the cam bar 92, the switch 116 will open and, hence, the circuit for the solenoid 119 will be broken and said solenoid will be deenergized.

The solenoid 119, when energized and deenergized, is utilized to render the described pawl and ratchet mechanism effective and ineffective, respectively, to raise the pile elevator and pile of sheets thereon. For this purpose, the movable core 122 (Fig. 2) of the solenoid 119 has pivotally connected to the projecting lower end thereof of the upper end of a vertical link 123. The lower end of the link 123 is pivotally connected to an arm 124 which is fixed on and projects forwardly from a short transverse shaft 125 (Figs. 1 and 2) journaled in suitable bearings in the side frame 10 and bracket 31. Fixed on the shaft 125 is a controlled member in the form of a latch 126 which extends forwardly from said shaft above the cam strap 25 and is adapted to normally engage the bevelled forward end of a hardened steel block 127 secured to the upper surface of said cam strap. Engagement of the latch 126 with the block 127 holds the cam strap 25 against return movement by the spring 28, thus preventing the cam follower roller 24 from following the low part of the cam 22 and operation of the pawl carrier 27 to engage the pawl 37 with the next tooth on the ratchet 38. The high part of the cam 22 is so proportioned that upon engagement of the same with the roller 24 during each cycle of operation a slight rearward movement is imparted to the cam strap 25 to free the latch 126 for disengagement from the block 127.

It will thus appear that when the solenoid 119 is energized, the core 122 thereof is electrically drawn upwardly and thus rocks the shaft 125 in the proper direction to lift the latch 126 out of engagement with the block 127. The cam strap 25 is then free to follow the low part of the cam 22 and operate the pawl carrier 27 to engage the pawl 37 with the next tooth on the ratchet 38, and thereafter rotate said ratchet and the shaft 34 upon continued rotation of said cam to raise the pile elevator and pile of sheets thereon. When the solenoid 119 is deenergized, the core 122 and latch 126 drop by gravity so that said latch is again positioned in the path of return movement of the block 127 to prevent the cam strap 25 from swinging the pawl carrier 27 and further raising of the elevator and pile of sheets thereon.

It will further appear that when the foot clamp 52 is moved by the lever 70 toward and away from the pile 21 into and out of engagement with the top thereof, the roller 88 is simultaneously moved by said lever downwardly and upwardly along and relative to the bar cam 92. In operation, with the top of the pile 21 at the proper feeding level, as indicated in broken lines in Fig. 3, where the sheet separating and forwarding devices 51 and 53 can act to properly separate and forward sheets from the pile, the bar cam 92 is first adjusted vertically by means of the adjusting screw 101 to a position such that the roller 88 will move idly along the low cam surface 90 only of said cam bar when the foot clamp 52 is lowered and raised as aforesaid. As long as the top of the pile 21 remains at a proper height, the foot clamp 52 will, as shown in broken lines in Fig. 3, be prevented by the pile from moving downwardly a sufficient distance to enable the roller 88 to engage the high cam surface 91 on the cam bar 92. The switch 116 will thus remain open, and the elevator and its pawl and ratchet operating mechanism will remain stationary because the pawl carrier 27, through engagement of the latch 126 with the cam strap 25 will be held in its power stroke position, as shown in Fig. 1, and prevented from returning to engage the pawl 37 with the next tooth on the ratchet 38.

When the height of the pile of sheets 21 decreases through removal of sheets from the top thereof, the roller 88, through increased downward movement of the foot clamp 52, as shown in full lines in Fig. 3, is caused to engage the high cam surface 91 on the bar cam 92, as shown in Fig. 3. Under these conditions, the bar cam 92 is swung by the roller 88 a slight distance forwardly about its pivot 93, the plunger pin 105, in turn, is moved forwardly by said cam bar, and the plunger 115 is actuated by said pin to close the switch 116 and complete the circuit to the solenoid 119. The solenoid 119 is then energized and draws the core 122 thereof upwardly, thereby raising the latch 126 and rendering the pawl and ratchet mechanism operative to raise the pile elevator and pile of sheets thereon as hereinbefore described.

When the foot clamp 52 is thereafter raised out of engagement with the pile of sheets 21 to the normal position thereof shown in Fig. 1, the roller 88 is also raised and moved out of engagement with the high cam surface 91 on the bar cam 92, thus releasing said bar cam. Thereupon, the contacts of switch 116 automatically open and cause the plunger 115 to return to its original position and move the bar cam 92 at the same time, through the plunger pin 105, to its original position with the low cam surface 90 thereof again engaged with the raised roller 88. Opening of the contacts of switch 116 deenergizes the solenoid 119, whereupon the core 122 and latch 126 drop by gravity and said latch is again positioned in the path of return movement of the cam strap 25, thus rendering the pawl and ratchet mechanism inoperative to further raise the pile elevator and pile of sheets thereon. If the pile of sheets has not been elevated sufficiently, the above described operations of the control mechanism and of the pawl and ratchet mechanism are repeated upon subsequent lowering of the foot clamp 52 and roller 88 until the top of the pile reaches the proper predetermined level.

The feeding level of the top of the pile of sheets 21 may be varied as desired to accommodate different stock conditions, and this is accomplished by rotating the adjusting screw 101 which may be effected while the feeder is in operation. When the screw is rotated in one direction, the bell-crank lever 95 will be swung in a counterclockwise direction, as viewed in Fig. 3, thereby raising the bar cam 92 and positioning the high cam surface 91 thereof nearer to the roller 88. The latter will then engage the high cam surface 91 sooner with the result that the normal feeding level of the top of the pile of sheets will be disposed in a higher plane. When the

screw 101 is rotated in the other direction, the bar cam 92 will be lowered, thus positioning the high cam surface 91 farther away from the roller 88 with the result that the normal feeding level of the top of the pile of sheets will be disposed in a lower plane.

If it is desired to raise the pile elevator and pile of sheets thereon during each cycle of operation of the feeder, as when handling thick sheets, such as cardboard, this may be effected by rotating the adjusting screw 101 and thereby raising the bar cam 92 until the high cam surface 91 is continuously engaged by the roller 88 during up and down movement thereof with the foot clamp 52. Under these conditions, the switch 116 will be held closed by the bar cam 92, and the solenoid 119 will be continuously energized to continuously hold the latch 126 out of engagement with the cam strap 25. The pawl and ratchet mechanism, through continued rotation of the cam 22 and the action of the spring 28, will then operate continuously to raise the pile elevator and pile of sheets during each cycle of operation of the feeder as the sheets are fed one after another from the top of the pile.

Upon completion of feeding of sheets from the pile, and in order to continue operation of the feeder, it is necessary to reload the elevator with a new pile of sheets. With the construction thus far described, the intermittently operated pawl and ratchet elevator operating mechanism and control means therefor will continue to function idly during loading and reloading of the elevator. It is accordingly desirable to discontinue the operation of the pawl and ratchet mechanism and the control means therefor while the elevator is being lowered and a new pile of sheets is being loaded thereon, whereby rapid and unnecessary wearing of the various elements of said mechanism and said control means is eliminated. Additionally, when the sheets being handled are of a nature such as to produce a soft or spongy pile thereof, the repeated engagement of the foot clamp 52 with the top of the pile is apt to compress the engaged portion of said pile beyond the normal feeding level sufficiently to cause the control means to function at the improper time and thereby effect raising of the pile to an improper level beyond the then existing normal feeding level thereof. In such instances, it is desirable to provide for temporarily discontinuing or preventing the operation of the control means and raising of the elevator until the pile is again restored to its normal feeding level through feeding of sheets from the top thereof.

The described pivotal mounting for the switch supporting bracket 107 advantageously provides for rendering the control means and the pawl and ratchet mechanism effective and ineffective at the will of the operator through movement of said bracket about the pivot pin 108 from the normal full line operative position thereof to the broken line inoperative position shown in Fig. 3, and vice versa. It will be noted that when the bracket 107 is moved from the full line position to the broken line position (Fig. 3), the switch actuating plunger pin 105 and the switch 116 move with said bracket and, hence, said plunger pin will be moved away from and out of the range of swinging movement of the bar cam 92 by the roller 88. Under these conditions, the bar cam 92 cannot reach the plunger pin 105 to actuate the same and close the switch 116 when said cam bar is actuated through downward movement of the roller 88 with the foot clamp 52 and engagement of said roller with the high cam surface 91 on said cam bar. The control means will thus be thrown out of operation with the switch 116 in opened condition and, hence, the elevator and the pawl and ratchet operating mechanism therefor will remain stationary until said control means is again thrown into operation through movement of the bracket 107 to the full line position shown in Fig. 3, determined through engagement of the rib 110 on the cover plate 109 on said bracket with the side plate 59, as hereinbefore described.

The bracket 107 is moved by the spring 111 to the described full line position thereof shown in Fig. 3. The means for moving the bracket 107 to the broken line position thereof shown in Fig. 3 may take any suitable form, and that particularly illustrated is a cam in the form of a tapered sleeve 128 (Figs. 2, 3 and 5) which is fixed on a shift rod 129 that extends transversely of the feeder and is slidably supported in suitable bearings in the end-brackets 57, 58. The sleeve or cam 128 is adapted to engage a roller 130 which is journaled on the forward end of the bracket 107. The rod 129 is provided at one end thereof with a knob 131 to facilitate shifting of said rod in opposite directions by the operator. The bracket 107 will thus be raised to the broken line position shown in Fig. 3 by the cam 128 upon movement of the rod 129 in one direction and engagement of said cam with the roller 130, and will be lowered to the full line position thereof by the contracting action of the spring 111 upon subsequent movement of said rod in the opposite direction and disengagement of said roller by the cam 128. During the normal operation of the feeder, the rod 129 may be operated at any time to render the control means effective or ineffective, as desired, without affecting the feeding of sheets from the top of the pile by the suction devices 51 and 53. When the pile of sheets is substantially exhausted through separation and feeding of the sheets therefrom and upward movement of the elevator, said elevator, upon disengagement of the clutch 33, 35, may be lowered by gravity to the bottom of the feeder to receive a new pile of sheets. At this time the rod 129 is shifted inwardly to render the control means ineffective and prevent idle operation of said control means and the pawl and ratchet mechanism. When a new pile of sheets has been loaded on the elevator and the latter and said pile have been raised so that the top of the pile is at proper height for feeding of the sheets therefrom, the clutch 33, 35 is again engaged and the rod 129 is shifted outwardly to render the control means again effective and provide for operation of the pawl and ratchet mechanism and raising of the elevator and pile of sheets thereon as and when required.

Although only a single embodiment of the invention has been illustrated in the accompanying drawings and described in the foregoing specification, it is to be expressly understood that said invention is not limited to said embodiment, and that various changes may be made therein without departing from the spirit and scope of the invention, as will now be clear to those skilled in the art. For example, the foot clamp 52 may be in the form of a blow pipe and connected with a source of compressed air and thus also act to wind and float the separated sheets. Additionally, the control means may be associated with mechanisms other than a pawl and ratchet drive, for example, a hydraulic mechanism, for intermittently raising a pile elevator and pile of sheets thereon, and may be advantageously utilized in pile elevator sheet deliveries for controlling the downward movement of the elevator as sheets are delivered one after another to and piled on said elevator. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. In a sheet feeder having mechanism for moving a supply of sheets, the combination of a substantially horizontal lever located above the sheet supply and mounted for pivotal movement about a horizontal axis, a feeler element carried by said lever and movable thereby downwardly into engagement with the top of the sheet supply, a vertical member pivotally connected at the lower end thereof directly to said lever and having a roller journaled on the upper end thereof, a vertically disposed straight bar cam mounted for pivotal movement about a horizontal axis and having a low cam surface followed by a high cam surface facing said roller, said roller being normally engaged with said low cam surface and caused to engage said high cam surface and thereby swing said bar cam

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about its pivot when the downward movement of said feeler exceeds a predetermined amount, a guide slidably engaged by said member for maintaining said roller in operative position with respect to said bar cam, and means including an electrical switch arranged to be engaged and actuated by said bar cam upon said swinging movement thereof for rendering said mechanism effective to move the sheet supply.

2. A control unit for a sheet feeder having a normally ineffective mechanism for moving a supply of sheets, and means including a solenoid for rendering said mechanism effective, said control unit comprising two vertically extending side plates arranged above the sheet supply and secured together in spaced parallel relation, a horizontal lever disposed between said plates and mounted for pivotal movement about a horizontal transverse axis, a feeler element carried by said lever and movable thereby downwardly into engagement with the top of the sheet supply, a vertically disposed elongated member connected at the lower end thereof directly to said lever for pivotal movement about a horizontal transverse axis, a roller journaled on said member at the upper end thereof, a vertically disposed straight bar cam mounted on one of said plates for pivotal movement at the upper end thereof about a horizontal transverse axis, said bar cam having a low cam surface followed by a high cam surface facing said roller, said roller being normally engaged with said low cam surface and caused to engage said high cam surface and thereby swing said bar cam about its pivotal axis when the downward movement of said feeler element exceeds a predetermined amount, a guide disposed between said plates and slidably engaged by said member for main-

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taining said roller in operative position with respect to said bar cam, and a normally open electrical switch carried by one of said plates and electrically connected with said solenoid, said switch being arranged for actuation by said bar cam upon said swinging movement thereof to thereby close the same and energize said solenoid.

3. A control unit as defined in claim 2, comprising a bracket for supporting said switch and mounted on one of said side plates for pivotal movement about a horizontal transverse axis, stop means on said bracket and engageable with one of said side plates for locating said switch in operative position with respect to said bar cam, and a manually operable cam slidable into engagement with said bracket for swinging the latter about said axis and thereby move said switch away from and out of the range of swinging movement of said bar cam by said roller while maintaining said bar cam and said elongated member in their relative operative positions.

4. A control unit as defined in claim 3, comprising a spring operably connected with said bracket for yieldingly holding said stop means in engagement with the said one of said side plates.

5. A control unit as defined in claim 3 wherein said stop means is in the form of a cover plate on said bracket for said switch and having an integral outwardly projecting bead thereon engageable with the other of said side plates.

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