

May 30, 1939.

P. CERNAK

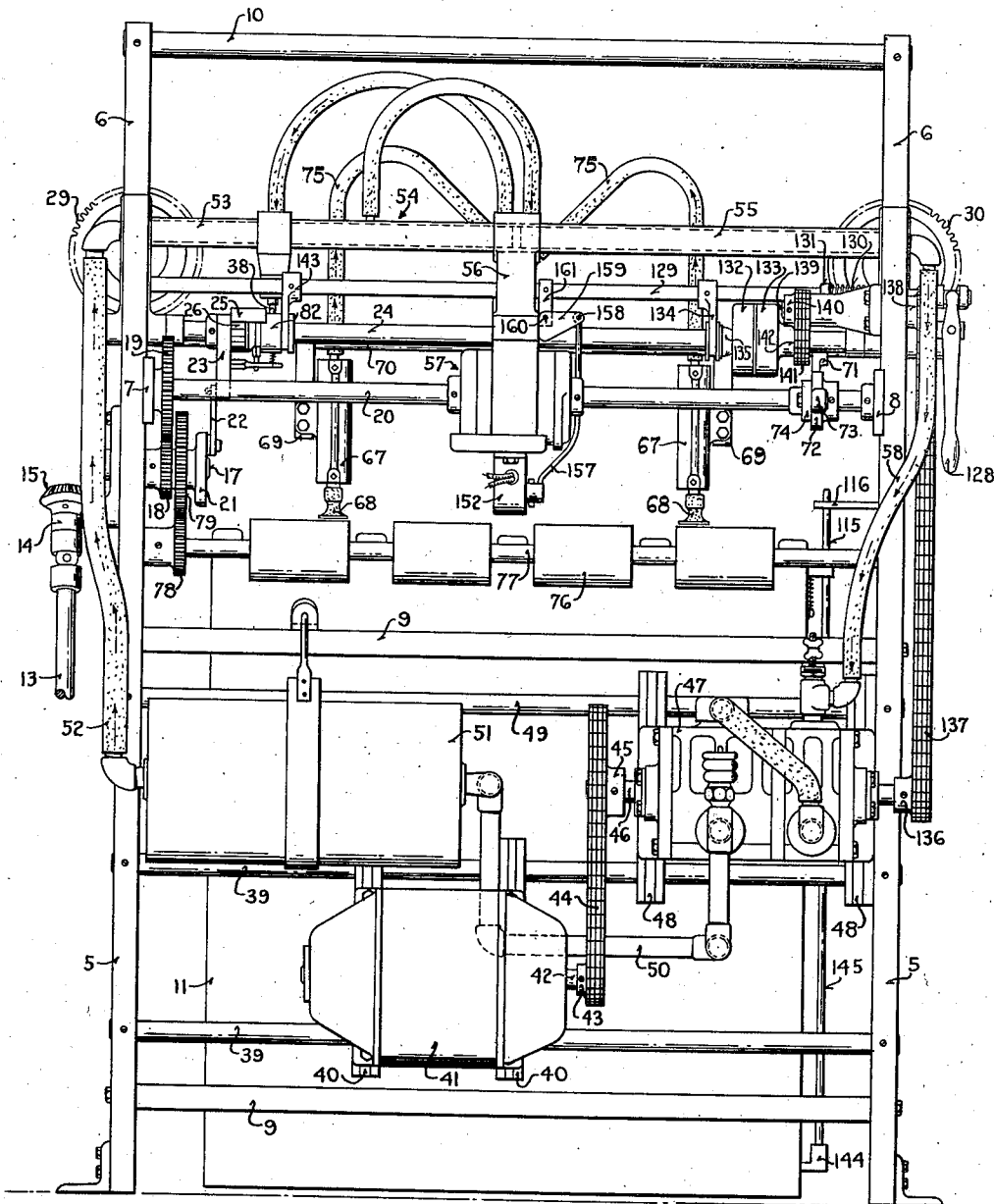
2,160,491

SHEET FEEDER

Filed Dec. 30, 1937

3 Sheets-Sheet 1

Fig. 1



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3 Sheets-Sheet 2

Fig. 2

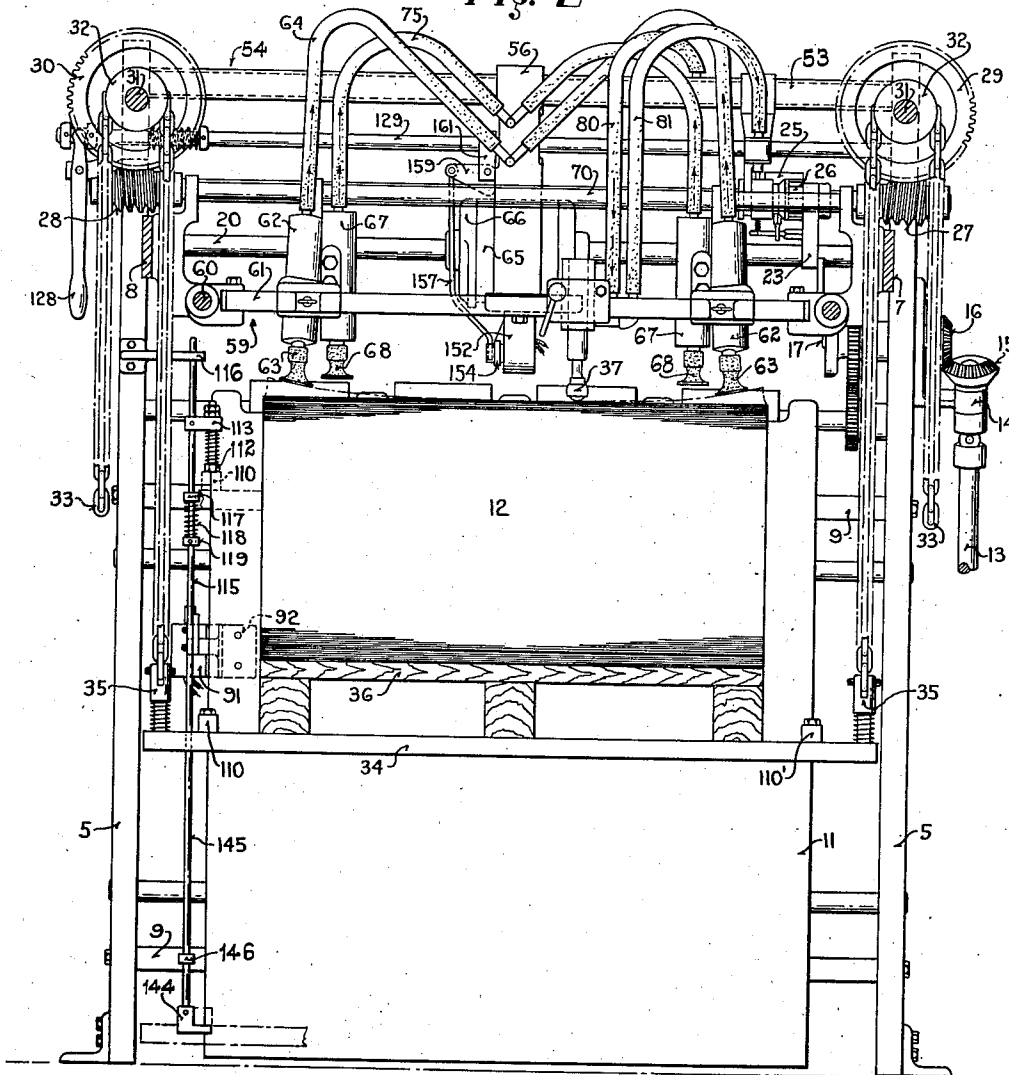
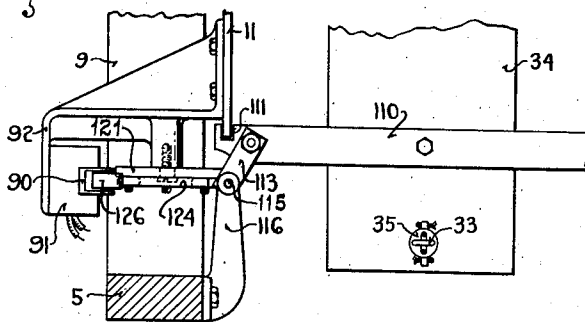


Fig. 4



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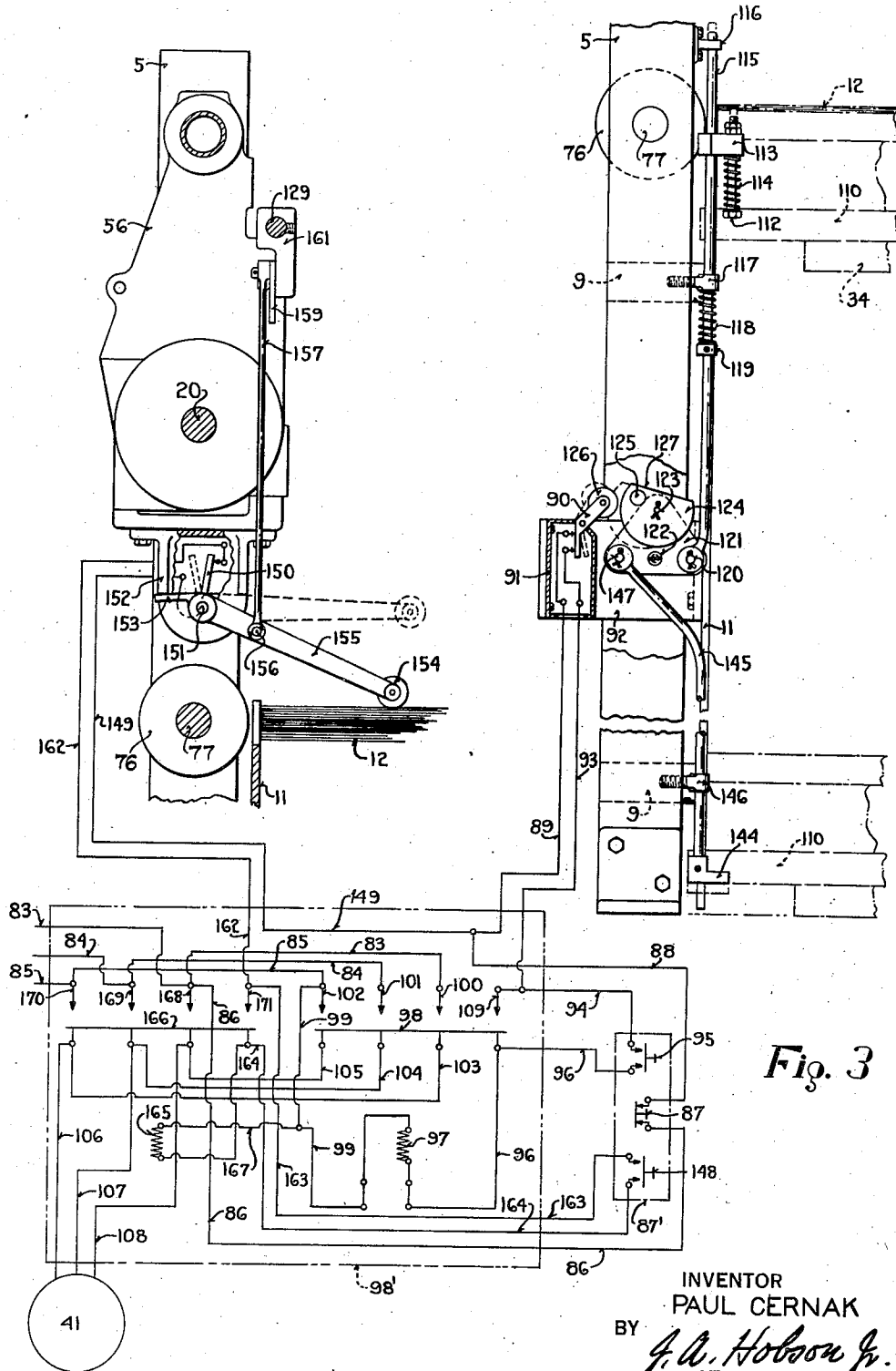
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SHEET FEEDER

Filed Dec. 30, 1937

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,160,491

SHEET FEEDER

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Application December 30, 1937, Serial No. 182,397

17 Claims. (Cl. 271-62)

This invention relates to sheet feeders and while capable of general use is more particularly adapted for embodiment in feeders for feeding sheets of tin, black iron, aluminum and the like, to printing presses, punch presses, coating and varnishing machines, and various other instrumentalities employed in the processing or making of metal articles or containers.

One object of the present invention is to provide an improved feed of novel, simple, and durable construction that will rapidly and efficiently feed sheets of metal or other materials to various types of equipment such as mentioned above.

Another object of the present invention is to provide an improved feeder the sheet feeding action of which, through the operation of novel means incorporated therein, may be automatically stopped about or just prior to the time a supply of sheets thereon has been exhausted.

Another object of the present invention is to provide an improved feeder which, through the action of novel means incorporated therein, may be rapidly reloaded while at the same time assuring that the feeder elevator will not be lowered too far, or beyond a predetermined point, for the reloading operation.

Another object of the present invention is to provide an improved feeder which, through the operation of other novel means incorporated therein, insures that the elevator, after loading of sheets thereon and through lifting of the same thereby to feeding position will not cause the top of the pile of sheets to rise above the certain predetermined height where separation and feeding or forwarding of the sheets from the pile is effected.

These and other objects of the present invention will appear as the following description thereof proceeds and in order to more clearly understand said invention reference may be had to the accompanying drawings which illustrate one embodiment thereof.

In said drawings:

Fig. 1 is a front elevation of a feeder embodying the present invention and particularly adapted for feeding metal sheets;

Fig. 2 is a rear elevation, partly in section, of the feeder shown in Fig. 1;

Fig. 3 is an enlarged detail view of pile elevator and feeder stopping devices shown in Figs. 1 and 2, illustrating diagrammatically an electric circuit for said devices; and

Fig. 4 is a top plan view, with parts omitted

of one of the stopping devices shown in Figs. 1, 2 and 3.

Referring to the drawings, wherein like reference characters designate like parts throughout the several views, the various movable parts of the feeder as well as certain stationary parts thereof may be mounted on a frame of any suitable construction and the movable parts employed during normal operation of the feeder may be actuated or driven by any suitable means. As hereinafter shown, said frame and driving means are preferably constructed as follows.

The feeder frame is comprised by front uprights 5 and rear uprights 6 connected together by side members 7 and 8 (Figs. 1 to 4, inclusive). The uprights 5 and 6 are bolted or otherwise suitably secured to the machine foundation, the front uprights 5 being connected together by cross members 9 bolted or otherwise suitably secured thereto, and the rear uprights 6 being connected together at the tops thereof by a stay shaft 10. The cross members 9 have bolted or otherwise suitably secured thereto a metal apron or plate 11 against which the front side of a supply or pile of metal or other sheets 12 bears during elevation of the same by mechanism to be hereinafter described.

Referring now more particularly to Figs. 1 and 2, the drive for the feeder is preferably comprised by an inclined driven jack shaft 13 which, in turn, is driven from any suitable source of power (not shown). The upper end of this jack shaft 13 is journaled in a suitable bearing provided by a bracket 14 that is bolted or otherwise suitably secured on one of the front uprights 5.

Fixed on the upper end of jack shaft 13 is a bevel gear 15 which meshes with a similar gear 16 fixed on a short shaft 17 journaled in suitable bearings in the bracket 14 and the adjacent front upright 5. Fixed on the short shaft 17 is a spur pinion 18 which meshes with a spur gear 19 that is fixed on a cam shaft 20. This cam shaft 20 is journaled in suitable bearings in the front uprights 5 and is utilized to operate various parts of the feeder to be hereinafter described. The feeder includes a pile elevator and operating mechanism therefor preferably constructed as follows.

The short shaft 17 has fixed thereon a crank disk 21 pivotally connected with one end of a link 22 the opposite end of which is pivotally connected with a pawl carrier 23 that is loosely mounted on a shaft 24 (Figs. 1 and 2). This shaft 24 extends transversely of the feeder and

is journaled in suitable bearings on the front uprights 5. Shaft 24 is operated at suitable intervals to raise the pile elevator hereinafter described and said operation of said shaft is preferably effected by pawl and ratchet mechanism of the general type disclosed in the application Serial No. 33,002 of Leonard Baker, filed July 25, 1935.

This pawl and ratchet mechanism includes the pawl carrier 23 and a pawl 25 pivoted thereon and adapted, under certain conditions, to engage a ratchet 26 fixed on the shaft 24. It will thus appear that through oscillation of the pawl carrier 23 by the described driving connections therefor with jack shaft 13 and through engagement of the oscillating pawl 25 with the ratchet 26, the shaft 24 will be intermittently rotated. Under these conditions right and left hand worms 27 and 28 fixed on shaft 24 will likewise be rotated. These worms 27 and 28 mesh with right and left hand worm gears 29 and 30 that are fixed on shafts 31 journaled in suitable bearings on the front and rear uprights 5 and 6.

Fixed on shafts 31 are toothed sheaves 32 in the teeth of which are engaged links of chains 33 so that when the shafts 31 are rotated in the proper direction by the described driving means therefor, said chains will be raised and thus raise an elevator comprising cross beams 34 to which the lower ends of said chains 33 are secured, as by suitable couplings or connections 35. The elevator 34 has placed thereon a pile board or skid 36 which, together with the pile of metal or other sheets 12, is positioned on said elevator through the rear of the feeder when the elevator is lowered by means for this purpose hereinafter described.

The elevator 34 and pile of sheets 12 thereon are raised intermittently as the sheets are fed off the top of the pile by sheet separating and forwarding devices hereinafter described, and to keep the top of said pile at a predetermined level for the operation of said means the elevator and its operating mechanism are preferably controlled by pneumatic means comprising a pile governor 37 and a mask detent 38 preferably mounted, constructed and operated as disclosed in the application serial No. 116,692 of Leonard Baker, George A. Martin and Leo C. Williams, filed December 19, 1936, and needing no detail description herein.

The feeder embodies means for supplying compressed air to pile and sheet winding devices (not shown), means for creating vacuum in the sheet separating and forwarding devices, and means for lowering and raising the elevator for loading and reloading purposes, and said means are preferably mounted, constructed and operated as follows: Extending across the feeder frame and secured in any suitable manner to the front uprights 5 thereof are cross shafts 39 (Fig. 1). These cross shafts 39 have bolted or otherwise suitably secured thereto brackets 40 which, in turn, have bolted or otherwise suitably secured thereto an electric motor 41. Fixed on the armature shaft 42 of motor 41 is a sprocket 43 around which passes a chain 44 that also passes around a sprocket 45 that is fixed on the shaft 46 of a pump 47 suitably constructed to supply air under pressure from one part thereof and to create vacuum in another part thereof.

This air and vacuum pump 47 is bolted or otherwise suitably secured above, and to one side of, the motor 41 on brackets 48 which, in turn, are bolted or otherwise suitably secured on one of

the cross shafts 39 and a third cross shaft 49 located thereabove and secured in any suitable manner on the front uprights 5. Connected with the exhaust or air pressure side or part of pump 47 is one end of a conduit 50 the opposite end of which is connected with a compressed air tank 51 secured in any suitable manner on the feeder frame above and to one side of the motor 41.

The compressed air tank 51 has connected therewith one end of a conduit 52 the opposite end of which is connected with one part 53 of a tubular shaft indicated broadly at 54. This tubular shaft 54 is divided centrally in any suitable manner and the other part of said shaft is indicated at 55. Part 53 provides an air supply conduit and part 55 provides a vacuum conduit and both of these parts are connected with the housing 56 of a valve mechanism 57 supported on the feeder in any suitable manner and through which the cam shaft 20 extends. The construction and operation of this valve mechanism is the same as that of the valve mechanism disclosed in application serial No. 116,692 above referred to and needs no detail description herein. The vacuum part or conduit 55 of tubular shaft 54 has connected therewith one end of a conduit 58 the opposite end of which is connected with the vacuum side or part of pump 47. The valve mechanism 57, through the described connections therefor with the pump 47, controls the delivery of air under pressure to the above mentioned pile and sheet winding devices (not shown), and the making and breaking of vacuum in sheet separating and forwarding devices hereinafter referred to.

Mounted on the feeder frame and secured thereto in any suitable manner, is an auxiliary frame 59 comprised by side members 60 and a rear cross member 61 mounted on said side members and adjustable therealong to various positions. The cross member 61 has mounted thereon the pile governor 37 and vacuum sheet separating devices comprised by cylinders 62 and suction cups 63 that are raised and lowered through the making and breaking of vacuum in said cylinders. These sheet separating devices are constructed and operated in the same manner as the sheet separating devices disclosed in application Serial No. 116,692 and need no detail description herein. It might be pointed out, however, that the cylinders 62 are connected by flexible hose 64 with the valve housing 56 and that the rotary valve 65 connected with the driving disk 66 fixed on cam shaft 20, is constructed and rotated to make and break vacuum in the sheet separating devices at predetermined intervals through the described connections for said devices with the valve housing 56 and the described connections for the latter with the vacuum side of pump 47.

The sheet forwarding devices are comprised by cylinders 67 and suction cups 68 that are raised up and down relative to the cylinders through the making and breaking of vacuum therein. These sheet forwarding devices are also constructed and operated in the same manner as the sheet forwarding devices disclosed in application Serial No. 116,692 and need no detail description herein. It is pointed out, however, that the sheet forwarding devices have swinging movement to advance the sheets that have been separated from the pile 12 by the sheet separating devices, and for this purpose cylinders 67 are secured on arms 69 which, in

turn, are fixed on a rock shaft 70 that extends transversely of the feeder frame and is journaled thereon in any suitable manner. The sheet forwarding devices are rocked rearwardly by a spring (not shown) having one end connected with an arm 71, Fig. 1, fixed on rock shaft 70, the opposite end of said spring being connected with the feeder frame. The sheet forwarding devices are rocked forwardly by a cam 72 fixed on and rotated by cam shaft 20. This cam 72 engages a cam roller 73 journaled on a cam strap 74 extending over cam shaft 20 and connected with the arm 71.

The making and breaking of vacuum in the cylinders 67 is also effected by the valve 65 at proper intervals, and for this purpose the cylinders 67 are connected by flexible hose 75 with the valve casing 56 which, as previously pointed out, is connected by the described connections with the vacuum side of pump 47.

The sheets separated from the pile 12 by the sheet separating devices, are taken by the sheet forwarding devices and delivered thereby to a sheet conveyor that advances the sheets to the machine with which the feeder is associated. As herein shown, this sheet conveyor includes feed rollers 76 secured by any suitable means in spaced relation on a driven shaft 77 that extends transversely of the feeder at the front thereof and is journaled in any suitable manner on the front uprights 5. The shaft 77 and feed rollers 76 are driven by suitable gearing including a gear 78 fixed on said shaft, and a gear 79 which meshes with the gear 78 and is fixed on and rotated by the short shaft 17.

In the normal operation of the feeder, the sheets are separated and forwarded from the pile by the sheet separating and forwarding devices and the latter deliver the sheets to the conveyor which advances them to the machine being fed. As the sheets are so separated, forwarded, and conveyed, the pile elevator is raised intermittently to compensate for removal of the sheets from the pile and to maintain the top of the latter at a predetermined elevation for the operation of the sheet separating and forwarding devices. This intermittent elevation of the pile elevator during normal operation of the feeder is effected through the described driving connections for the elevator with the jack shaft 13 which connections include the pawl and ratchet mechanism 25, 26 utilized for driving the elevator operating shaft 24 and the operation of which, in turn, is controlled by the pneumatic pile governor 37. The casing for the pneumatic governor 37 is connected by a flexible hose 80 with the compressed air supply conduit 53 and said casing is further connected by a flexible hose 81 with the casing for the detent 38. This detent 38 through raising and lowering movement in accordance with the raising and lowering movement of governor 37, controls the movement of a pawl mask 82 which, in turn, controls the operation of the pawl and ratchet mechanism 25, 26 and the intermittent upward movement of the pile elevator, all as described in application Serial No. 116,692 above referred to.

During normal operation of the feeder, the pump 47 is driven by the motor 41 to supply compressed air to the conduit 53 and to create vacuum in the sheet separating and forwarding devices, all as set forth in application Serial No. 116,692. The motor 41 is of the three phase type supplied with current from any suitable source through lead wires 83, 84 and 85 (Fig. 3). Wire

83 is connected by a wire 86 with one terminal of a normally closed switch 87. This switch 87 is arranged in a switch box 87' indicated in dotted lines in Fig. 3 and mounted by suitable means at any convenient point on the feeder frame. The other terminal of switch 87 is connected by a wire 88 with a wire 89 which, in turn, is connected with one terminal of a normally closed switch 90 pivoted on a switch box 91 that is bolted or otherwise suitably secured on a bracket 92. This bracket 92, in turn, is bolted or otherwise suitably secured to the metal apron or plate 11 that forms a guide for the front of the pile of sheets 12 (Figs. 3 and 4). The other terminal of switch 90 is connected by a wire 93 with a wire 94 which, in turn is connected with one terminal of a normally open motor starting switch 95 in the switch box 87'. The switch 95 is of the push button type and is actuated or closed by the machine attendant to start the motor 41. The other terminal of switch 95 is connected by a wire 96 with a coil 97 of a magnetic switch 98 arranged in a control box 98' indicated in dotted lines in Fig. 3 and secured by suitable means at any convenient point on the feeder frame.

The coil 97, in turn, is connected by a wire 99 with the wire 85 and it will thus appear that when the switch 95 is closed by the machine attendant, the coil 97 will be energized and actuate the switch 98 to close it in contact with terminals 100, 101 and 102 of wires 83, 84 and 85. Closing of the switch 98 starts the motor 41 which receives current from wires 83, 84 and 85 through wires 103, 104 and 105 connected with switch 98 and with wires 106, 107 and 108 which, in turn, are connected with said motor. The switch 95, having been closed by the machine attendant, is opened as soon as he releases it, thus disconnecting the wires 94 and 96. The wire 96, however, connected with switch 95, is also connected with the switch 98, and when the latter is closed, it contacts the terminal 109 of wire 94. The coil 97 thus continues to be energized and maintain the switch 98 closed, regardless of the opening of switch 95.

In accordance with the present invention means are provided to stop the sheet feeding operation of the feeder when a supply of sheets elevated intermittently by the mechanism described for this purpose is nearly exhausted. Said means stops the pump 47 and prevents further operation of the sheet separating and forwarding devices which, if allowed to continue in operation when the pile is completely exhausted, might cause trouble in the feeder and damage to said devices. Said feeder stopping means is preferably mounted, constructed, and operated as follows.

The elevator 34 has secured thereto side bars 110 and 110' (Figs. 2, 3 and 4). These bars extend forwardly and rearwardly of the feeder and are provided on their forward ends with notches 111 (Fig. 4) engaged over the side edges of plate 11 to guide the elevator during its raising and lowering movements. Arranged in the path of travel of the bar 110 near the upper limit of the travel of the elevator 34 is a stop member 112. This stop member, when contacted by said bar 110, acts to stop the motor 41 and the pump 47, and cut off the latter from the sheet separating and forwarding devices so that said devices are thrown out of operation when the elevator has been raised sufficiently and only a few sheets of the supply remain thereon.

The stop member 12 is carried by an arm 113, there being a spring 114 interposed between said arm and the lower end of the stop member in order that the latter may yieldably engage the bar 110 when the elevator is raised sufficiently for this purpose as, for example, to the upper dotted line position thereof shown in Fig. 3. The arm 113 is adjustably secured in any suitable manner on a rod 115 that is guided in brackets 116 and 117 secured in any suitable manner on one of the front uprights 5 and the uppermost cross member 9 respectively. Rod 115 carries a spring 118 the upper end of which bears against bracket 117 and the lower end of which bears against a collar 119 adjustably secured in any suitable manner on said rod. The lower end of rod 115 is pivotally connected at 120 with the inner lower corner of a triangular plate 121 that is pivotally mounted at 122 on the bracket 92. This plate 121 has pivoted thereon at 123 a disk 124 provided therein with an opening 125 for actuation of said disk manually by the machine attendant in a manner to be hereinafter described. The disk 124 is pivoted so that its major portion of its weight is below its pivot. Therefore said disk, when disengaged from a roller 126 on switch 90, always assumes its normal position indicated in full lines in Fig. 3.

Assuming that the elevator 34 during feeding of the sheets one after another from the top of the pile 12 by the separating and forwarding devices, has been raised intermittently by the pawl and ratchet mechanism 25, 26, and only a few sheets of the supply remain on said elevator, the bar 110 will contact stop 112, lift the rod 115 against the action of the spring 118, rotate the plate 121 and the disk 124 counter clockwise as viewed in Fig. 3, and cause the disk 124 to contact roller 126 on switch 90 and thus open said switch as indicated in dotted lines in Fig. 3. Opening of the switch 90 breaks the circuit to coil 97 that includes the wires 83, 86, the switch 87, the wires 88, 89 and 93, contact 109 and switch 98, and wires 96, 99 and 85. This circuit being broken, the coil 97 is deenergized, the switch 98 is opened, and the motor 41 and the pump 47 are stopped. Stopping of the pump 47 throws the sheet separating and forwarding devices out of operation and prevents feeding of the remaining sheets on the elevator. This, in turn, prevents further operation of the governor 37 and further raising of the elevator.

In accordance with the present invention means are provided to rapidly lower the elevator in order to load or reload it and to stop said elevator in a predetermined lowered position in order to prevent overrunning of the chains 33 and disengagement of the same from the sheaves 32. Said means are preferably mounted, constructed and operated as follows and includes the disk 124 and the switch 90. Upon the stopping of upward movement of the elevator with a few remaining sheets thereon, as previously described, the machine attendant grips the disk 124 through the opening 125 therein and turns it counter clockwise (Fig. 3) until a flat face 127 of said disk is brought opposite the roller 126. The switch 90, through the action of a spring (not shown) is then closed whereupon the switch 95 is again pushed by the machine attendant to start the motor 41 in the manner previously described. Starting of the motor 41, of course, starts the pump 47 whereupon the machine attendant pushes a lever 128 to the left as viewed in Fig. 1. The lever 128 is mounted on the feeder

frame in any suitable manner and connected at its upper end with a shift rod 129 extending transversely of the feeder and slidably mounted in suitable bearings on the front uprights 5.

The shift rod 129 and the lever 128 are normally maintained in the inoperative, full line positions thereof shown in Figs. 1 and 2 by a spring 130 that is mounted on said shift rod between a collar 131 thereon and the adjacent front upright 5. In the inoperative positions of the lever 128 and the shift rod 129, and during normal operation of the feeder, the parts 132, 133 of a clutch on shaft 24 are disconnected. When the lever 128 is shifted to the left, however, a fork 134 on rod 129 is shifted to the right therewith and actuates a clutch connector 135 which connects the two parts of the clutch 132, 133. Shaft 24 is then driven in the proper direction by pump 47 to rapidly lower the elevator 34. For this purpose, the driven shaft 46 of the pump has fixed thereon a sprocket 136 around which passes a chain 137 that also passes around a sprocket 138 on a short shaft 139 journaled in suitable bearings on one of the front uprights 5.

This shaft 139 has fixed thereon a sprocket 140 around which passes a chain 141 that also passes around a sprocket 142 fixed on the clutch part 133 which, together with said last named sprocket, is loosely mounted on shaft 24. The clutch part 132 is fixed on shaft 24 and when the two parts of the clutch are connected as above described, shaft 24 is driven in the proper direction by the described driving connections therefor with pump 47 to rapidly lower the elevator 34. When the lever 128 is pushed to the left, a fork 143 fixed on shift rod 129 is moved therewith to the right. This fork 143 engages loosely over the mask 82 and, when moved to the right, shifts said mask in the same direction, thus throwing the pawl and ratchet mechanism 25, 26 out of operation and disconnecting the drive between the elevator and the jack shaft 13 so that the elevator may be lowered, without interference, by the pump drive therefor. As the elevator begins to lower it is disengaged from stop 112 whereupon spring 118 actuates rod 115 and plate 121 so that these parts, together with disk 124, assume the full line inoperative positions thereof and switch 90 is closed.

The elevator, upon rapid lowering thereof may be stopped in a predetermined lowered position by the machine attendant moving the lever 128 to its full line inoperative position which action also returns shift rod 129 to its full line inoperative position, disconnecting the clutch parts 132, 133 and returning the mask 82 to its normal operative position. Disconnection of the clutch parts 132, 133 in this manner disconnects the drive for the elevator through the clutch from pump 47 to the elevator operating shaft 24, and the elevator is thereupon stopped in proper position for loading or reloading. The machine attendant then actuates switch 87 to open it and thus deenergize coil 97 so that switch 98 is opened and the motor 41 and pump 47 are stopped. Switch 87 closes when released by the machine attendant but at this time switch 95 is open and switch 98 will not be actuated to start motor 41.

If, for any reason, the machine attendant fails to move lever 128 as aforesaid and stop the elevator when it reaches its proper lowered position for loading or reloading, means are provided, in accordance with the present invention, to auto-

matically perform this function and said means are preferably mounted, constructed and operated as follows.

Positioned near the bottom of the feeder in the path of travel of the bar 110 is a stop member 144. Upon failure of the machine attendant to stop the elevator when it is lowered to its proper loading or reloading position, the bar 110, as indicated in dotted lines in the lower right hand side of Fig. 3, will strike the stop member 144 and actuate it to stop the motor 41 and the pump 47 and thus prevent further lowering of said elevator. For this purpose, stop 144 is adjustably secured on the lower end of a rod 145 guided in a bracket 146 secured in any suitable manner to the lowermost cross member 9. The upper end of rod 145 is pivotally connected at 147 with the outer lower corner of triangular plate 121 and in the event bar 110 strikes stop 144, plate 121 and disk 124 are rotated counter clockwise as viewed in Fig. 3 so that disk 124 strikes roller 126, opens switch 90, and stops motor 41 and pump 47 in the manner previously described. In the event stop 144 is actuated to open switch 90, raising of the elevator, as hereinafter described, enables spring 118 to move the rods 115 and 145 and the parts connected therewith to their full line positions shown in Fig. 3 so that disk 124 is disengaged from roller 126 and switch 90 is closed by a spring (not shown).

The elevator having been lowered and stopped in its proper predetermined position for loading or reloading, and a pile of sheets having been placed on the elevator, the latter and the pile of sheets are rapidly elevated until the top of the pile is brought into proper position for the normal sheet feeding operations. Accordingly, the machine attendant first moves lever 128 to the left so as to connect shaft 24 with pump 47, close a switch 150, and lower a switch operating arm 155, all as presently to be described. The machine attendant then pushes a switch 148 in box 87' which starts the motor 41 so that it rotates in a direction reverse to that in which it was rotated to drive the pump 47 during the normal operation of the feeder and when lowering the pile elevator to load or reload it. In this case, the switch 87, as in the previous case, is closed and current flows through the wire 83, wire 86, switch 87, wire 88 and a wire 149 connected with said wire 88. Wire 149 is connected with the switch 150. Switch 150 is pivoted at 151 in a box 152 that is bolted or otherwise suitably secured to the valve housing 56 at the under side thereof. Switch 150 is provided with a lug 153 that engages the box 152 when the switch is closed and thus prevents lowering of a roller 154 beyond a predetermined point. Roller 154 is journaled on the free end of the arm 155 that is also pivoted at 151 on box 152 and is secured to, or formed integrally with switch 150 and lug 153. Arm 155 has pivotally connected therewith at 156 the lower end of a rod 157 the upper end of which is pivotally connected at 158 with a triangular plate 159. Plate 159, under certain conditions, bears against one side of the valve casing 56 and is pivotally mounted at 160 on a frame 161 that is bolted or otherwise suitably secured on the shift rod 129.

When lever 128 is shifted to the left, for connection of the elevator with the pump and rapid lowering or raising of said elevator thereby, rod 129 and arm 161 are shifted to the right, thus moving plate 159 in the same direction out of engagement with valve housing 56 and allowing

arm 155 to drop by gravity and close switch 150. It will thus appear that when switch 148 is pushed to start motor 41 in the reverse direction and rapidly raise the elevator and the pile of sheets thereon, switch 150 will be closed.

Under these conditions, current flows from wire 149 through switch 150, wire 162 and a wire 163 connected with said wire 162. Wire 163 is connected with one terminal of the switch 148 and when the latter is closed current flows through said switch and through a wire 164 connected with the other terminal thereof. Wire 164 is connected with the coil 165 of a magnetic switch 166 in box 98', and said coil is connected by wires 167 and 99 with the wire 85. It will thus appear that when the switch 148 is closed coil 165 will be energized, thus actuating switch 166 and closing it in contact with the terminals 168, 169 and 170 of wires 83, 84 and 85.

When the switch 166 is closed, current flows to motor 41 from wires 83, 84, 85 through wires 106, 107, 108 which are connected with said switch. The switch 148, like the switch 95, is a push button switch that opens when it is released, thus disconnecting the wires 163 and 164. The wire 164, however, connected with switch 148, is also connected with the switch 166 which, when closed, contacts a terminal 171 of wire 162 connected with wire 163, thus maintaining current in coil 165 and holding switch 166 closed, regardless of the opening of switch 148.

As stated above, prior to the time the machine attendant pushes the switch 148 and starts the motor 41 in the reverse direction aforesaid, he pushes the lever 128 to the left. This moves the shaft 129 to the right, allows the lever 155 to drop and close switch 150, and engages the parts of clutch 132, 133 to connect the elevator operating shaft 24 with the pump shaft 46 as previously described. This having been done, and the switch 148 having been pushed to start the motor 41 in reverse direction of rotation, the elevator and the pile of sheets thereon are rapidly raised by the pump 47 which is now being driven by the motor 41 in a direction reverse to that in which it was driven when the elevator was rapidly lowered to load or reload it.

As the top of the rapidly raising pile approaches the predetermined level where the sheet separating and forwarding devices may be rendered operative to separate and feed the sheets one after another from the pile, the machine attendant moves the lever 128 to its inoperative position. The parts of the clutch 132, 133 are thus disengaged, the pump 47 is thereby disconnected from the elevator operating shaft 24, and the latter is connected through shifting of the mask 82 by rod 129 with the normally employed elevator operating mechanism comprised by the pawl and ratchet 25, 26 and the jack shaft 13. When lever 128 is moved to its inoperative position, plate 159 engages valve housing 56 and causes arm 155 and roller 154 to move upwardly to the dotted line inoperative positions thereof shown in Fig. 3. The switch 150 is thus opened, thereby stopping motor 41 and pump 47. Thereupon the switch 95 may be pushed to start motor 41 and pump 47 in the original direction and the elevator is operated by the jack shaft 13 and pawl and ratchet mechanism 25, 26 as sheets are separated and fed from the top of the pile by the sheet separating and forwarding devices. During this particular operation the switch 150 remains open because the arm 155 and roller 154

are held up in inoperative positions through engagement of plate 159 with valve housing 56. Roller 154 therefore cannot be lowered to close said switch during the normal sheet feeding operation of the feeder. Excess wear on the switch and frequent repairs or replacements thereto are thus prevented by reason of the fact that during the normal sheet feeding operations the roller 154 does not rest on the top of the pile and no movement is imparted to said roller, the arm 155 or the switch 150.

If the machine attendant, for any reason, fails to move lever 128 to its inoperative position when the top of the rapidly raising pile reaches the aforesaid predetermined level, the roller 154 remains in its lowered position and switch 150 remains closed. The top of the rapidly raising pile 12 will then engage roller 154, swing arm 155 upwardly, and open switch 150. Under these conditions, current will no longer flow through the coil 165 and switch 166 will therefore open thus disconnecting motor 41 from wires 83, 84 and 85 and stopping said motor, the pump 47, and the drive from the pump to the elevator so that further raising movement of the elevator is prevented and it is stopped with the top of the pile at the aforesaid predetermined height.

The rapidly raising elevator having been stopped, and the lever 128 having been moved to its inoperative position by the machine attendant, normal operation of the feeder is again initiated in the manner previously described through intermittent elevation of the elevator and pile of sheets, action of the sheet separating and forwarding devices, and operation of the pump 47 by the motor 41 which, of course, is again started in its original direction of rotation through closing of switch 95 by the machine attendant.

The operation of the feeder embodying the present invention will be clearly understood from the foregoing description and while said description and the accompanying drawings set forth with more or less particularity one embodiment of the invention, it is to be expressly understood that said invention is not limited to said embodiment or otherwise than by the terms of the appended claims.

What I claim is:

1. In a sheet feeder having sheet feeding means, a pile elevator, and mechanism for intermittently raising the elevator and pile during feeding of sheets from the top of said pile by said sheet feeding means, separate motor driven means for rendering the sheet feeding means effective to feed sheets from the top of the pile as aforesaid, and elevator controlled means for throwing said separate motor driven means and the sheet feeding means out of operation when the elevator reaches a certain height and prior to feeding of all the sheets therefrom.

2. In a sheet feeder having suction sheet feeding means, a pile elevator, and mechanism for intermittently raising the elevator and pile during feeding of sheets from the top of said pile by said suction sheet feeding means, separate motor driven vacuum pump means for rendering the suction sheet feeding means effective to feed sheets from the top of the pile as aforesaid, and means actuated by the elevator when it reaches a predetermined height for throwing said separate motor driven pump means and said suction sheet feeding means out of operation prior to feeding of all the sheets from said pile.

3. In a sheet feeder having suction sheet feeding means, a pile elevator, and power driven mechanism for intermittently raising the elevator and pile, during feeding of sheets from the top of said pile by said suction sheet feeding means, a vacuum pump for rendering the suction sheet feeding means effective to feed sheets from the top of the pile as aforesaid, means for rapidly raising and lowering the elevator, an electric motor, separate from said power driven mechanism, for driving both the vacuum pump and the elevator raising and lowering means, pile actuated switch means for stopping the motor and the rapid raising of the elevator thereby, and elevator actuated means for automatically stopping lowering movement of said elevator by said motor at a predetermined loading or reloading position therefor.

4. In a sheet feeder having suction sheet feeding means, a pile elevator, and mechanism for intermittently raising the elevator and pile during feeding of sheets from the top of said pile by said suction sheet feeding means, separate motor driven pump means connected with the suction sheet feeding means for creating suction therein, means for connecting the separate motor driven pump means with the elevator and for thereby rapidly lowering said elevator to load or reload it, and elevator actuated switch means for throwing the separate motor driven pump means out of operation and stopping lowering movement of the elevator at a predetermined loading or reloading position therefor.

5. In a sheet feeder having suction sheet feeding means, a pile elevator, and mechanism for intermittently raising the elevator and pile during feeding of sheets from the top of said pile by the suction sheet feeding means, separate motor driven pump means for creating suction in the suction sheet feeding means, mechanism for connecting the motor driven pump means with the elevator and for thereby rapidly lowering the elevator to load or reload it, a switch for throwing the motor driven pump means out of operation, elevator actuated means for operating the switch when the elevator has been raised to a predetermined position and for thereby throwing said sheet feeding means out of operation, and elevator actuated means for operating said switch when the elevator has been rapidly lowered to a predetermined position and for thereby stopping lowering movement of said elevator.

6. In a sheet feeder having suction sheet feeding means, a pile elevator, and mechanism for intermittently raising the elevator and pile during feeding of sheets from the top of said pile by the suction sheet feeding means, separate motor driven pump means for creating suction in the suction sheet feeding means, mechanism for connecting the separate motor driven pump means with the elevator and for thereby rapidly raising said elevator and the pile to bring the top of the latter to proper position for feeding of sheets therefrom by the suction sheet feeding means, and means movable into operative position by said last named mechanism and comprising pile actuated switch means for throwing the separate motor driven pump means out of operation and stopping upward movement of the elevator and pile thereby when the top of said pile reaches said position.

7. In a sheet feeder having sheet feeding means, a pile elevator, and mechanism for operating the elevator under normal feeding condi-

tions, separate motor driven means for rapidly raising the elevator and pile to bring the top of the latter to proper position for feeding of sheets therefrom by said sheet feeding means, clutch means for connecting the elevator with and disconnecting the same from the separate motor driven means, and switch means controlled by said clutch means and controlling said separate motor driven means.

8. In a sheet feeder having sheet feeding means, a pile elevator, and mechanism for operating the elevator under normal feeding conditions, separate motor driven means for rapidly raising the elevator and pile to bring the top of the latter to proper position for feeding of sheets therefrom by the sheet feeding means, switch means controlling the operation of the separate motor driven means and movable to operative and inoperative positions relative to the pile, clutch means for connecting the separate motor driven means with and for disconnecting the same from the pile elevator, and connections between the clutch means and the switch means for moving the latter to its operative and inoperative positions aforesaid.

9. In a sheet feeder having sheet feeding means and intermittently operated pile elevating means, separate motor driven means for rapidly raising the elevator to bring the top of the pile to proper position for feeding of sheets therefrom by the sheet feeding means, switch means operable through engagement with the pile to stop the separate motor driven means when the top of the pile reaches said position, and means normally holding said switch means in an inoperative position away from said pile.

10. In a sheet feeder, a pile elevator, mechanism for intermittently raising the pile elevator, means for rapidly raising and lowering said pile elevator including an electric motor, a clutch for selectively connecting the pile elevator with said mechanism and said means, clutch and pile controlled switch means for controlling the electric motor, and elevator controlled switch means controlling said electric motor.

11. In a sheet feeder, a pile elevator, mechanism for intermittently raising the pile elevator, means for rapidly raising and lowering the pile elevator including an electric motor, devices for selectively connecting the pile elevator with said mechanism and said means, and elevator controlled switch means for stopping said motor and the rapid raising or lowering of said elevator thereby.

12. In a sheet feeder, a pile elevator, sheet feeding devices, mechanism for intermittently raising the pile elevator during operation of the sheet feeding devices, means for rapidly raising and lowering the elevator including a pump for creating vacuum in the sheet feeding devices and an electric motor for driving said pump, devices for selectively connecting the elevator with said mechanism and said means, pile controlled switch means controlling said motor and rapid raising of the elevator, and elevator controlled switch means controlling said motor, operation of said

sheet feeding devices, and rapid lowering of said elevator.

13. In a sheet feeder, a pile elevator, a source of power, means connected with the source of power for intermittently raising the pile elevator, a motor, mechanism connected with said motor and adapted to rapidly lower the pile elevator to a predetermined position to load or reload it and to rapidly raise said elevator and pile thereon to a predetermined position, and two independent switch means controlled by the elevator and pile respectively, one switch means being adapted to stop said motor when the elevator and pile reach the aforesaid raised position and the other switch means being adapted to stop the motor and the elevator when said elevator reaches said lowered position.

14. In a sheet feeder, a pile elevator, mechanism for intermittently raising the pile elevator, mechanism for rapidly raising said pile elevator including an electric motor, a switch normally held out of the path of the pile on said elevator and adapted when lowered to be actuated by the top of said pile when it reaches a predetermined position and thereby stop said motor, and means for connecting said motor with said elevator and for lowering the switch.

15. In a sheet feeder, a pile elevator, mechanism for intermittently raising the pile elevator, means for rapidly raising the pile elevator including an electric motor, clutch devices for selectively connecting the pile elevator with said mechanism and said means, a normally inoperative switch for controlling the electric motor, and connections between the clutch devices and the switch holding the latter in an inoperative position remote from the pile during operation of said mechanism and allowing the switch to move to an operative position for contact by said pile during operation of said means.

16. In a sheet feeder, a pile elevator, sheet feeding devices, mechanism for intermittently raising the pile elevator during operation of the sheet feeding devices, means for rapidly raising and lowering the elevator including an electric motor, devices for selectively connecting the elevator with said mechanism and said means, pile controlled switch means controlling said motor and rapid raising of the elevator thereby, and means separate from said pile controlled switch means for automatically stopping lowering movement of said elevator by said motor at a predetermined loading or reloading position.

17. In a sheet feeder, a pile elevator, sheet feeding devices, mechanism for intermittently raising the pile elevator during operation of the sheet feeding devices, means for rapidly raising and lowering the elevator including an electric motor, devices for selectively connecting the elevator with said mechanism and said means, pile controlled switch means controlling said motor and rapid raising of the elevator thereby, and switch means, separate from said pile controlled switch means, for controlling said motor and rapid lowering of the elevator thereby.

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