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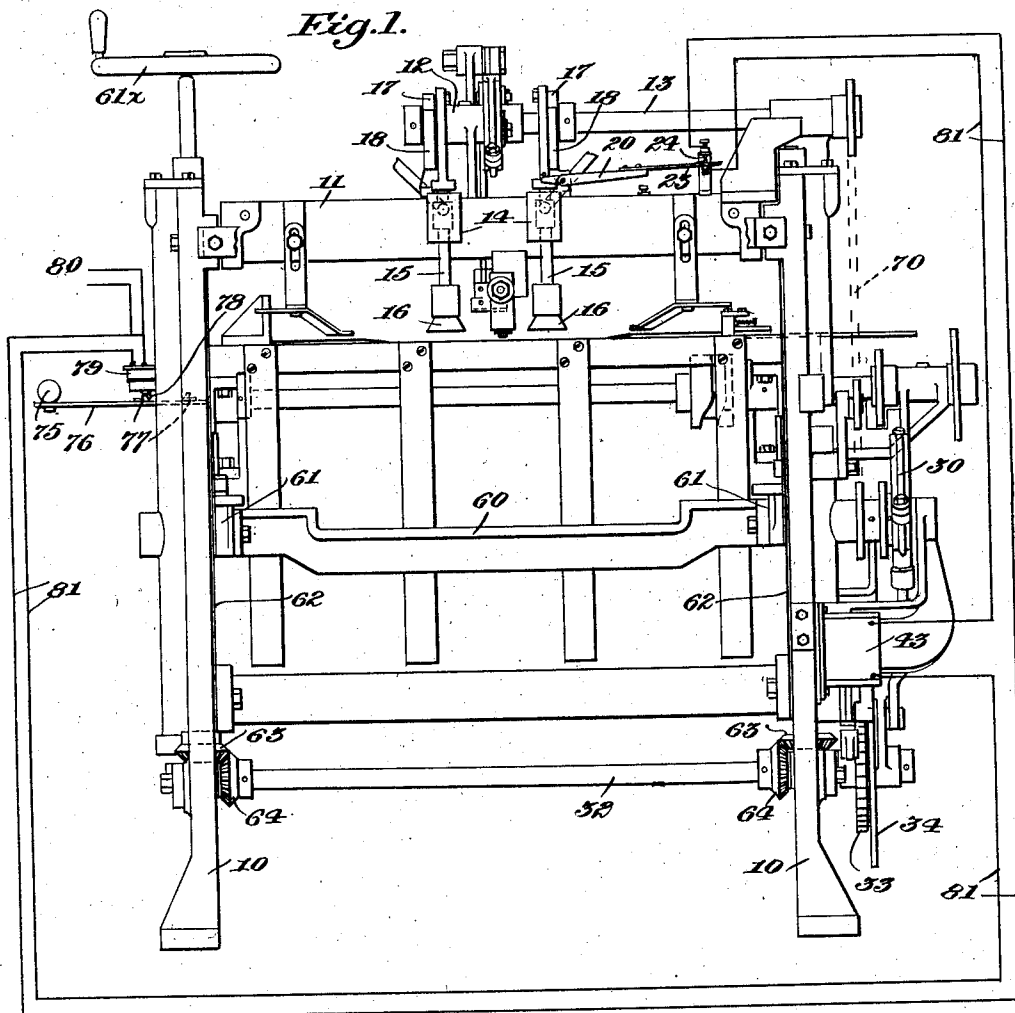
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H. A. FINK

AUTOMATIC STACK LIFTING DEVICE

Filed Jan. 14, 1928

4 Sheets-Sheet 1



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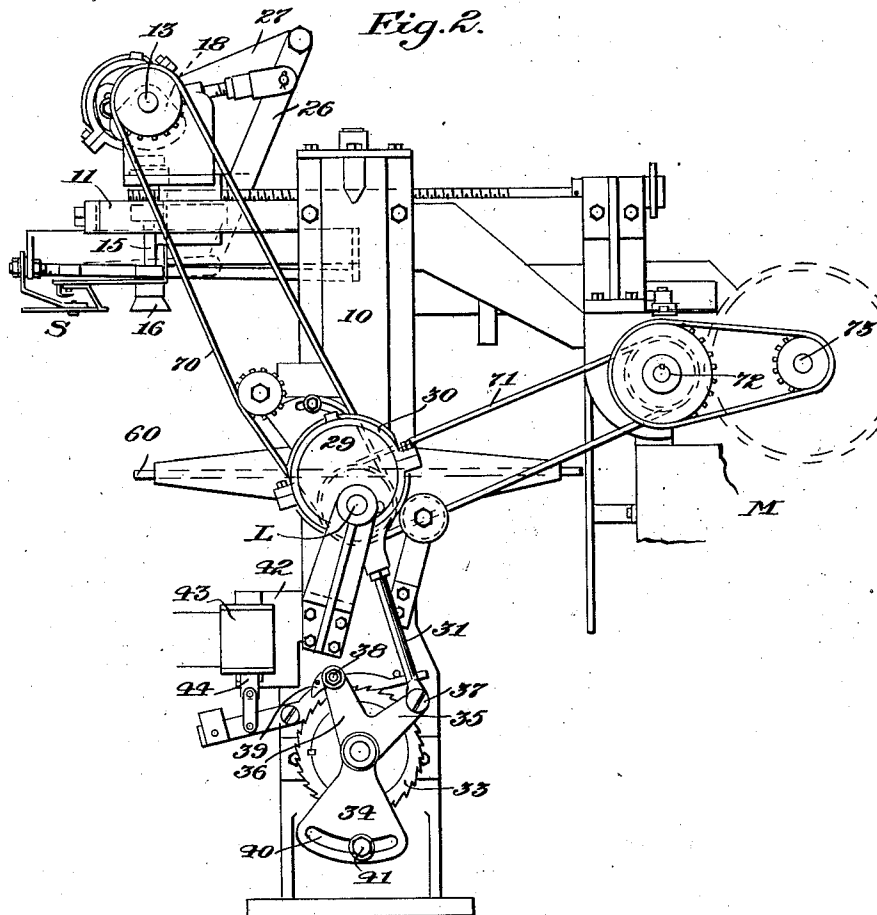
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AUTOMATIC STACK LIFTING DEVICE

Filed Jan. 14, 1928

4 Sheets-Sheet 2



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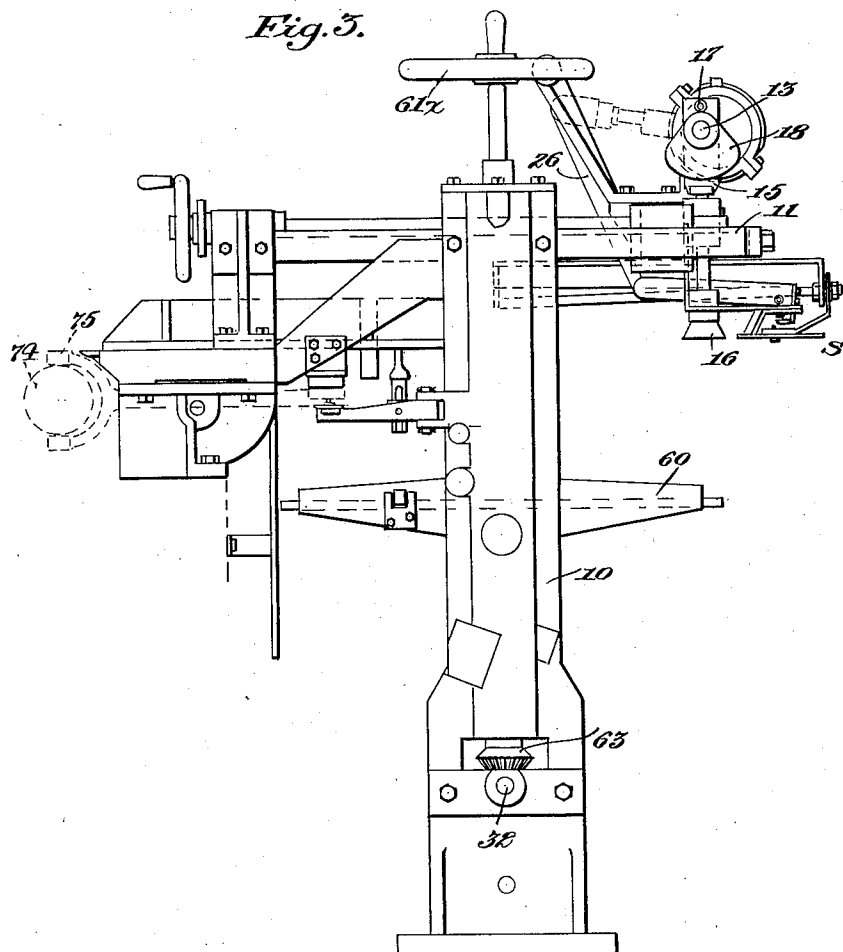
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4 Sheets-Sheet 3

*Fig. 3.*



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**Dec. 11, 1928.**

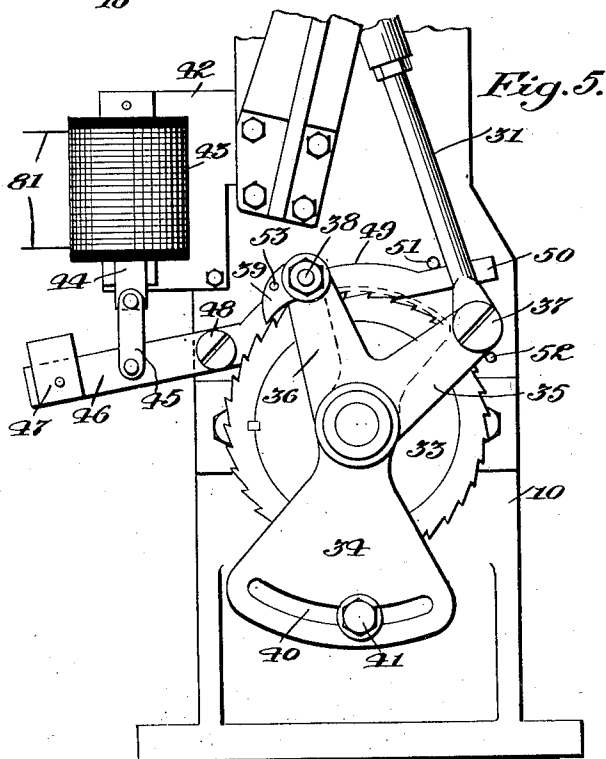
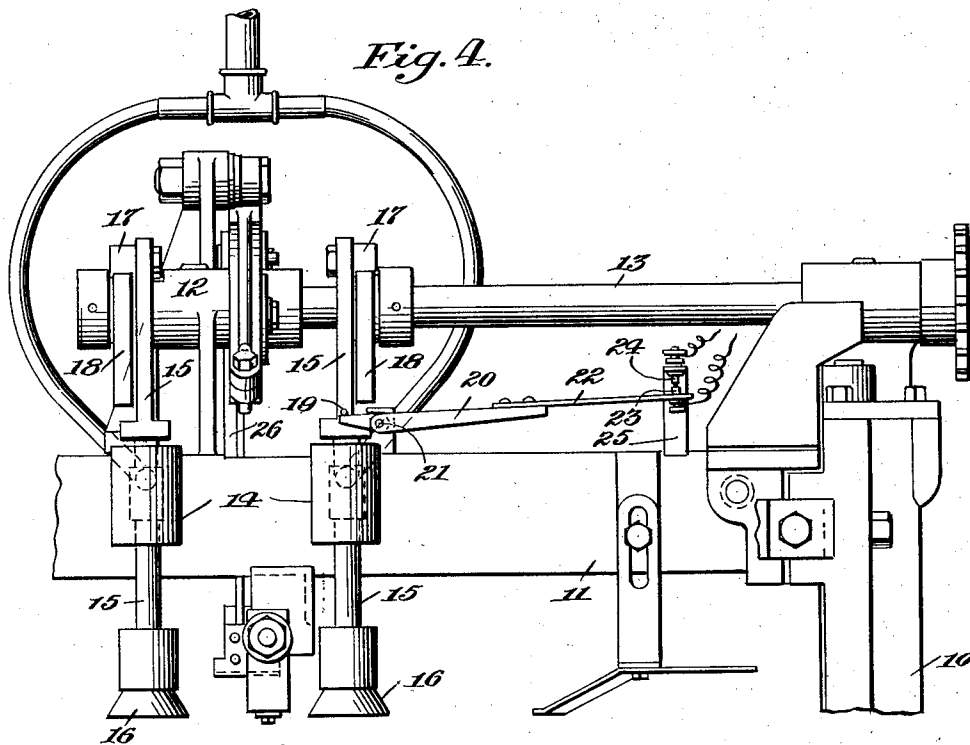
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# AUTOMATIC STACK LIFTING DEVICE

Filed Jan. 14, 1928

4 Sheets-Sheet 4



## UNITED STATES PATENT OFFICE.

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## AUTOMATIC STACK-LIFTING DEVICE

Application filed January 14, 1928. Serial No. 246,842.

This invention relates to sheet feeding mechanism and more particularly to the stack controlling portion thereof.

Many types of devices have heretofore been proposed for taking a sheet from a stack and delivering it to a machine which operates upon the sheet. The present device is concerned with an automatic mechanism for controlling the lifting of the stack after a sheet has been removed therefrom, so that the upper surface of each successive top sheet of the stack is brought to approximately the same position for engagement by the feeding mechanism: so that in effect the top surface of the stack retains this predetermined level.

Another feature of the present invention is the employment of a part of the sheet feeding mechanism itself to control the actuation of the stack elevating devices, and in the particular illustrative form employing a pneumatic sheet lifter, the suction plunger in its reciprocating movement governs the actuation of the stack elevating mechanism.

A further feature of the present invention is that the movement of the stack occurs when the sheet lifting devices are at the lowest part of their movement, and thereafter the stack elevating mechanism is thrown out of operation for the remaining portion of the movement of the sheet lifting devices; so that when the sheet lifting devices are employed to actuate the controlling means, the elevation of the stack occurs while the lifting devices are in contact with the top sheet.

Still another feature of the invention is the provision of a stack elevating mechanism employing a ratchet and roller mechanism for elevating, the pawl for the ratchet being normally out of engagement therewith, and only brought into engagement therewith when it is necessary to lift the stack: so that when the mechanism is, so to speak, de-energized, i. e., when it is no longer necessary to lift the stack, the parts automatically return to an inoperative position.

With these and other objects in view as will appear in the course of the following specification and claims, one form of execution of the invention has been represented by way of illustration on the accompanying drawings, in which:

Figure 1 is a front elevation of a sheet feed-

ing mechanism having the present invention embodied therein.

Fig. 2 is an elevation of the right hand end of this machine.

Fig. 3 is an elevation of the left hand end of this machine.

Fig. 4 is a detailed view in fragmentary front elevation on an enlarged scale, of the controlling elements.

Fig. 5 is a fragmentary side elevation showing in detail the pawl and ratchet advancing mechanism with associated throw-out.

In these drawings, there is represented a sheet feeding mechanism used in conjunction with a sheet slitter, by way of illustration of the employment of the sheet feeder in conjunction with a single drive for the feeding of the slitting machine.

The sheet feeder includes a platform to receive a stack of sheets, and a sheet removing device for taking the top sheet of the stack and delivering it to the slitting machine. The illustrated form of sheet handling device is a suction cup which is periodically raised and lowered. In the lowered position the cup is intended to engage the topmost sheet, then to raise the sheet and to deliver it to advancing means which delivers it to the slitting machine. Devices driven from the main drive are employed to raise the platform intermittently and cooperate with the sheet lifting devices so that the platform is raised in proportion to the withdrawal of sheets from the top of the stack, so that the top of the stack is maintained substantially at a predetermined level.

The sheet feeding machine includes standards 10 which at the upper end carry an outstanding bracket 11 that in turn supports the journal members 12 of a rotatable shaft 13. Mounted for vertical sliding movement in the guides 14 of the bracket 11 are the plungers 15 which carry at their lower ends the suction cups 16. At the upper ends, the plungers 15 are provided with rollers 17. Fixedly mounted on the shaft 13 are cams 18 for engagement with the respective rollers 17, so that during the rotation of the shaft 13 the cams move therewith, and thus the rollers and plungers 15 are moved upward so that the suction cups 16 are raised, and by the weight of these members the rollers 17 are drawn

downward again and maintained normally in contact with the surface of the respective cams 18.

One of the plungers 15 is provided with a pin 19. A lever arm 20, is mounted on the bracket 11 by a pivot 21 and extends one end beneath the pin 19 for engagement thereby following a predetermined, downward movement of the plunger 15, while the other end of the lever 20 carries a spring blade 22 having at its outer end an electrical contact member 23. This contact member is insulated from the machine frame, and is adapted upon a clockwise movement of the lever 20 and spring 22, to engage and establish electrical conductive relationship with a fixed contact 24 carried on an insulating standard 25 of the bracket 11. It will be noted that upon a given downward movement of the plunger 15 the pin 19 will rock the lever 20 in a counterclockwise direction and thus make an electrical contact between the members 23 and 24.

The shaft 13 likewise carries suitable mechanism such as an eccentric and strap to actuate a rock lever 26 which is pivoted on an auxiliary bracket 27 of the main bracket 11, and at its lower end carries mechanisms indicated generally by S for the purpose of taking the sheet which has been raised by the suction cup 16 and delivering it into a suitable sheet working machine such as the slitter M. These devices and the machine may be of any well known type and operation.

On the frame 10 is likewise journaled a shaft L having an eccentric 29 thereon embraced by the eccentric strap 30, which is mounted on the end of an eccentric rod 31. A transverse shaft 32 is journaled in both frame members 10 and extends at one end through the frame member and carries keyed thereon a ratchet wheel 33, and in addition thereto a rocker comprising the counterweight portion 34 and the two arms 35, 36. The arm 35 is connected by a pivot 37 with the eccentric rod 31: while the arm 36 has a pivot 38 to support a pawl 39 which is presented for engagement with the teeth of the ratchet wheel 33. The counterweight 34 has an arcuate slot 40 in which a heavy bolt 41 may be moved and clamped for the accurate adjustment of the counterweight effect.

A bracket 42 of a frame member 10 supports an electromagnet 43 having a movable plunger 44 carrying the pivoted connection link 45, which in turn is pivoted to the lever 46. This lever 46 has an adjustable counterweight 47 at its end to cause it to normally rock in a counterclockwise direction about its pivot 48 on the frame 10. The end of the lever 46 beyond the pivot 48 has an arcuate upper surface 49 and an extending end finger 50 which is adapted to be limited in its movement and therewith to determine the end positions of the whole lever by respective engagement with the stop pins 51 and 52 of

the frame 10. The pawl 39 carries a pin 53 which may rest upon the arcuate upper surface 49 of the lever 46.

The feeding machine is likewise provided with a platform or stack table 60 mounted on carriages 61, 61 to travel up and down vertically on guide rails of the standards 10. These carriages have threaded portions to engage with the vertical screws 62, each of which is journaled for rotation about a vertical axis, and each of which is provided at its lower end with a bevel gear 63 in mesh with the respective bevel gears 64 keyed to the transverse shaft 32. It is preferred to provide a hand wheel 61\* on the upper end of one of the screws 61 so that the stack may be raised and lowered by hand.

A chain drive 70 is provided between sprockets on the shaft 13 and the shaft L, and a similar chain drive 71 is provided between a sprocket on the shaft L and a shaft 72 of the machine M, which in turn is driven from the main drive shaft 73 of the latter through a clutch member 74, which is actuated by a forked clutch rod 75. This clutch rod is pivotally connected to a link 76 which is guided in a standard 10 of the machine, and carries the upwardly extending fingers 77 which are adapted in their movement to engage and actuate the finger 78 of a tumbler switch 79. It will be understood that when the clutch lever 75 is moved to connect the main shaft 73 for power driving, the link 76 at the same time moves the tumbler switch 79 so that power is furnished to the elevating control mechanism, as will be described hereinafter: and vice versa when the lever 75 is moved to disconnect the power drive from the machinery, the tumbler switch 79 opens this circuit. In this way, the control system and the machines are made ready for operation and are disconnected simultaneously.

The electrical connections comprise the conductors 81 leading from a source 80 of electric current, such as the lighting means, through the switch 79 to the electromagnet 43 and to the contacts 23, 24, so that when the switch 79 is closed the circuit through the electromagnet 43 is opened only at the contacts 23, 24.

The method of operation of the structure is as follows: When a bale of sheets has been placed upon the table 20 and has been raised by the hand wheel 61\* to the approximate height for lifting, and the clutch lever 75 has been moved to deliver power to the drive shaft 72 and to close the tumbler switch 79, the shafts L and 13 are simultaneously driven. The plungers 15 are moved up and down by the engagement of the rollers 17 with the surface of the cams 18, and by the usual well known means the suction cups 16 are evacuated at the proper moments to seize the topmost sheet of the stack if this stack is engaged by the cups. Then during a further

rotation of the shaft 13 and the cams 18 this sheet is raised away from the stack, and then by means of an eccentric on shaft 13, the lever 26 is actuated to move the parts S to receive this sheet and deliver it to the slitting machine N in known manner.

As successive sheets are taken from the stack, the height of the latter above the prevailing position of the platform 60 is decreased, until finally the permissible travel of the cups 16 is no longer sufficient to seize a sheet by the suction effect and to deliver it properly to the advancing devices S. When, however, the plungers 15 have been moved downward for more than a predetermined maximum distance, the pin 19 has engaged the lever 20 and rocked about its pivot near the bottom of the stroke of the plungers 15, so that contact is established between the points 23, 24, thereby closing the electrical circuit above referred to and energizing the electromagnet 43.

This electromagnet attracts its core and therewith rocks the lever 46 clockwise about its pivot 48, causing the arcuate surface 49 to move downward until the finger 50 is engaged against stop pin 52. The surface 49 no longer supports the pin 53 of the pawl 39, and the latter falls into engagement with the teeth of the ratchet wheel 33. During the whole rotation of the shaft 13, the shaft L has been revolving and driving its eccentric 29, so that the eccentric rod 31 has been rocking the lever and counterweight system 34, 35, 36 continuously, but without effect upon the ratchet wheel 33 so long as the pawl 39 is held out of contact with the teeth thereof. Since now the pawl is in engagement with these teeth, the downward movement of the eccentric rod 31 causes the pawl to clock freely over the teeth in one direction, and the upward movement of the eccentric rod 31 causes the pawl to advance the ratchet wheel 39 in a counterclockwise direction in Fig. 2, thus rotating shaft 32 and therewith the screws 62, and raising the table 61. The stack of sheets is therefore raised while the suction cups 16 are in the lowered position, and after the stack has been raised by a distance sufficient to lift the plungers 15 until the pin 19 is no longer engaged with the lever 20, the contact will be broken at points 23, 24: the electromagnet 43 deenergized, and the lever 46 will rock about its pivot under the action of the counterweight 47, so that the pawl 39 is once more raised away from the ratchet teeth, and the partial rotation given the ratchet wheel 33 will be less than the rocking movement of the lever and counterweight system 34, 35, 36. It is apparent that a very accurate control and raising of the stack is thus afforded.

When the plungers 15 are raised, the pin 19 will always disengage the lever 20, so that the circuit will be interrupted at the contact

points 23, 24 and no elevation of the stack can occur except when the plungers 15 and the cups 16 are at or near their lowermost position. In this way the machine is prevented from raising the stack so high that the rollers 17 become disengaged from the cams 18 during any part of the rotation of the latter, which may result in a sudden or jerky starting of the upward movement of the suction cups 16, and therewith an engagement of more than one sheet of the material.

It will be understood that the illustrative form set forth on the drawings and the above description is not by way of limitation, and that the invention may be practiced in many ways within the scope of the appended claims.

What is claimed as new is:

1. In a feeder apparatus for the individual sheets of a stack, a stack-raising mechanism and a source of power for the same, lifting means to engage and lift the top sheet of the stack and adapted to move upward and downward relative to the stack and being limited in the downward movement by the top of the stack, and a stack-raising control device including a circuit breaker which is normally open, means to close the circuit breaker during the time the lifting means is below a predetermined position, a circuit including said circuit breaker, and means controlled by said circuit when closed to connect said source of power to said mechanism to produce a raising of the stack.

2. In a feeder apparatus for the individual sheets of a stack, a stack-raising mechanism and a source of power for the same, a suction cup and actuating devices therefor to engage and lift the top sheet of the stack and adapted to move upward and downward relative to the stack, said suction cup engaging the upper surface of the top sheet of the stack and being limited in the downward movement thereby, a lever controlling a normally open contact, a pin on the cup plunger to move the lever to close the contact upon a downward movement of said cup beyond a predetermined position, a circuit including said contacts, and means controlled by said circuit when closed to connect said source of power to said mechanism to produce a raising of the stack.

3. In a feeder apparatus for the individual sheets of a stack, a platform to support the stack and means to raise the platform including a shaft, a ratchet fixed to said shaft, a pawl adapted to engage said ratchet to move the same, a rocker carried by said pawl, a source of power and connections therefrom to move said rocker; devices including an electric circuit breaker which is normally open, and means to close said breaker when the top of said stack is below a predetermined position, and a circuit including an electromagnet, which is energized when said circuit breaker is closed, and means operated by the

said electromagnet when energized to permit said pawl to engage and move said ratchet, and operating when said electromagnet is deenergized to remove said pawl from said ratchet.

4. In a feeder apparatus for the individual sheets of a stack, a platform to support the stack, means to raise said platform including a shaft, a ratchet fixed on said shaft, a pawl adapted to engage said ratchet, a rocker carrying said pawl, a source of power and connections from the same to move said rocker; an electric circuit breaker which is normally open and means to close the same when the top of said stack is below a predetermined position, and a circuit including an electromagnet energized when said circuit breaker is closed; a lever having a guide surface, a projection on said pawl adapted to slide on said surface when said lever is in the first position so that the pawl is held out of engagement with the ratchet, said electromagnet when energized moving said lever into said first position so that said pawl is permitted to engage and move said ratchet, and means operative when said electromagnet is deenergized to move said lever to disengage said pawl from said ratchet.

5. In a feeder apparatus for the individual sheets of a stack, a platform to support the

stack, means to raise the platform with the stack thereon, and including a shaft, a ratchet fixed on said shaft, lifting means to engage and lift the top sheet of the stack and adapted to move upward and downward relative to the stack and being limited in the downward movement by the top of the stack, a normally open circuit breaker and means on said lifting means to close said circuit breaker upon a downward movement of the lifting means beyond a predetermined position, a circuit including an electromagnet energized when the circuit breaker is closed, a pawl adapted to engage said ratchet, a rocker carrying said pawl, a source of power and connections from the same to move the rocker, a lever having a guide surface and being operated by said electromagnet when energized to permit said pawl to engage the ratchet so that the power transmitted through the rocker and pawl will advance the ratchet and raise the platform, and means to move the lever in the opposite direction when the electromagnet is deenergized so that the pawl is held away from the ratchet; whereby the platform and the stack thereon are raised after and when the lifting devices pass below such predetermined position.

In testimony whereof, I affix my signature.

HENRY A. FINK.