Oct. 31, 1961 T. J. ELLIOTT ET AL 3,006,635

METHOD AND MEANS FOR FEEDING SHEETS

Filed Dec. 13, 1957 5 Sheets-Sheet 1

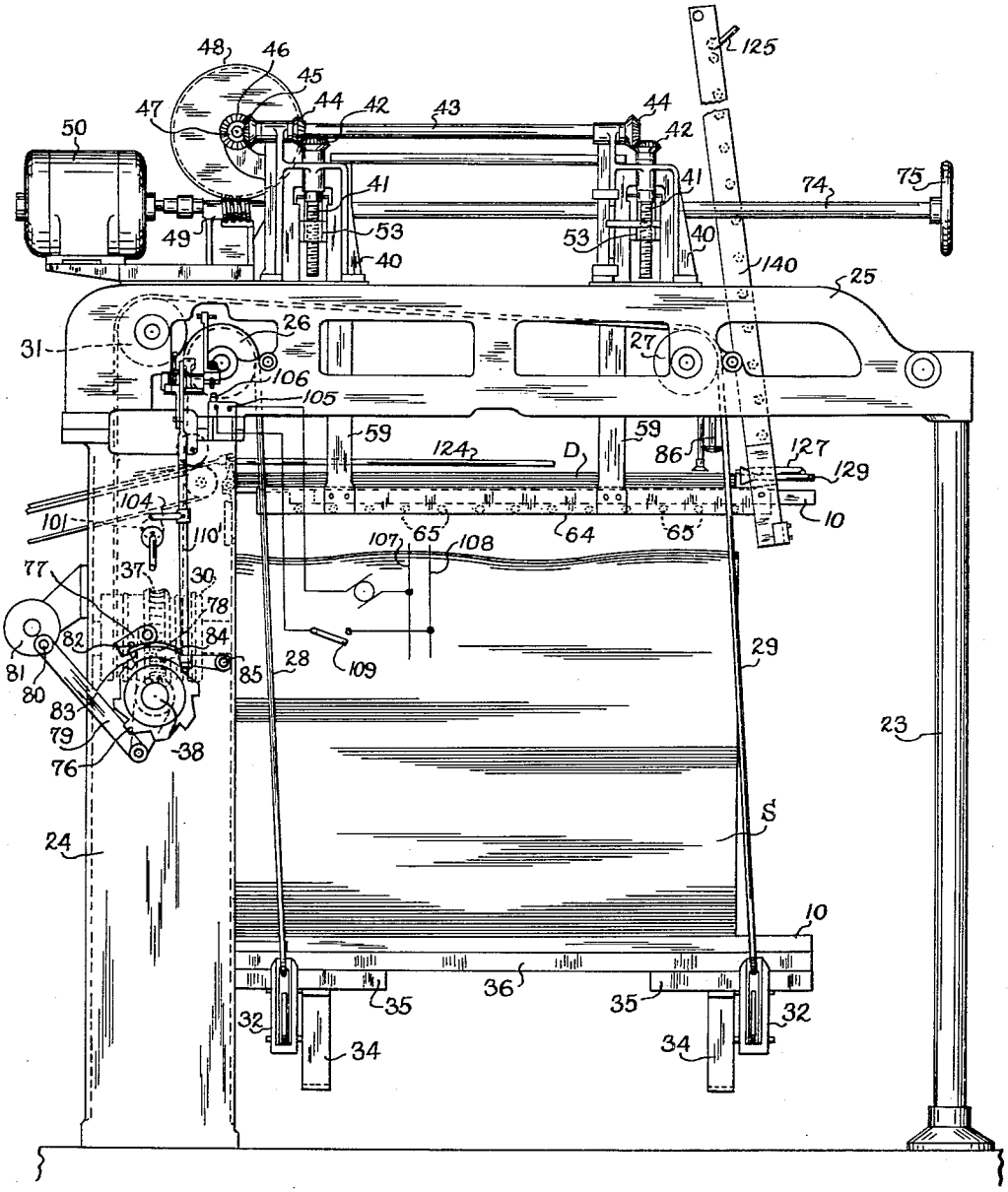


FIG. 1

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METHOD AND MEANS FOR FEEDING SHEETS

Filed Dec. 13, 1957 5 Sheets-Sheet 2

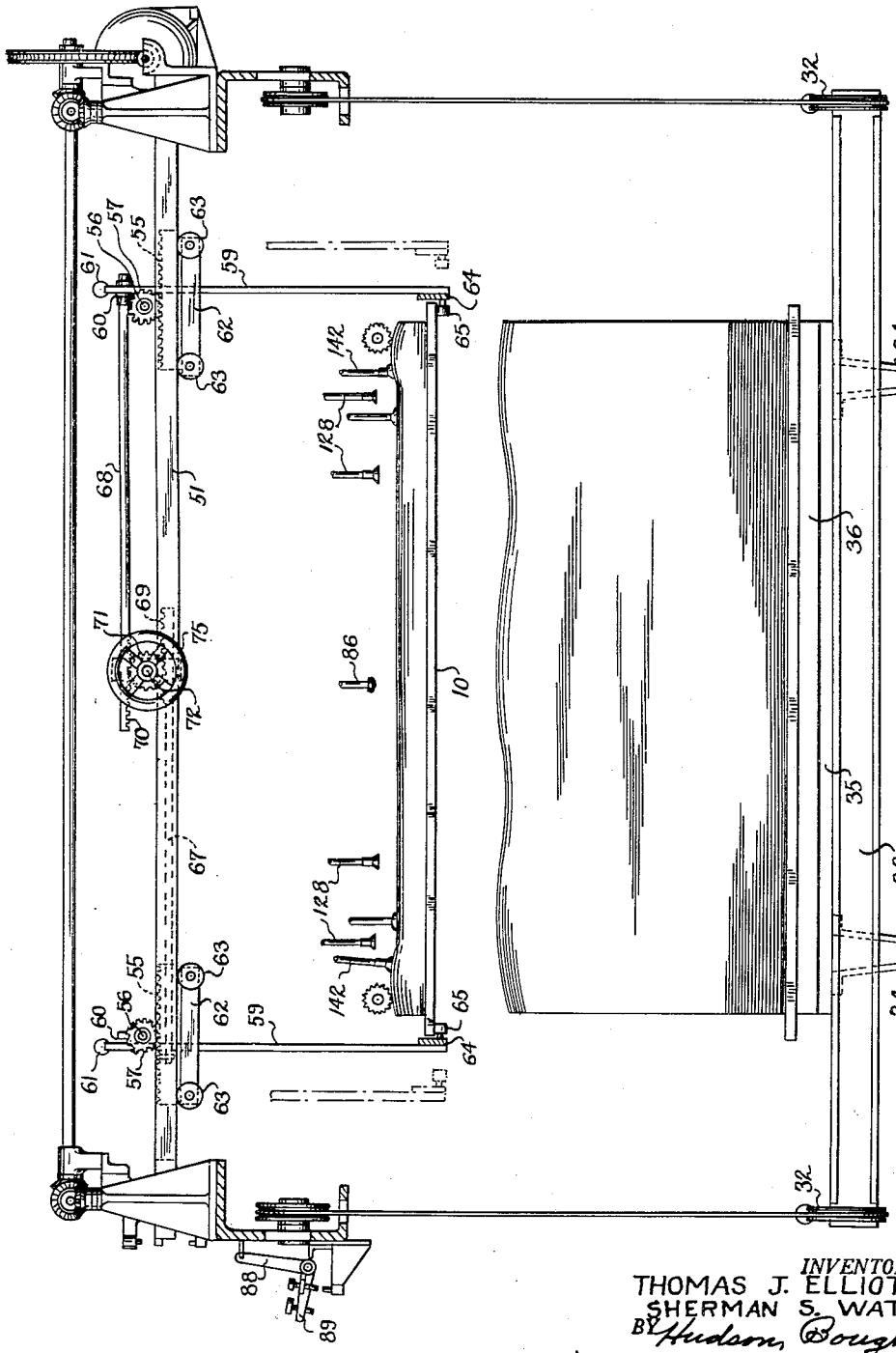


FIG. 2

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METHOD AND MEANS FOR FEEDING SHEETS

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FIG. 3

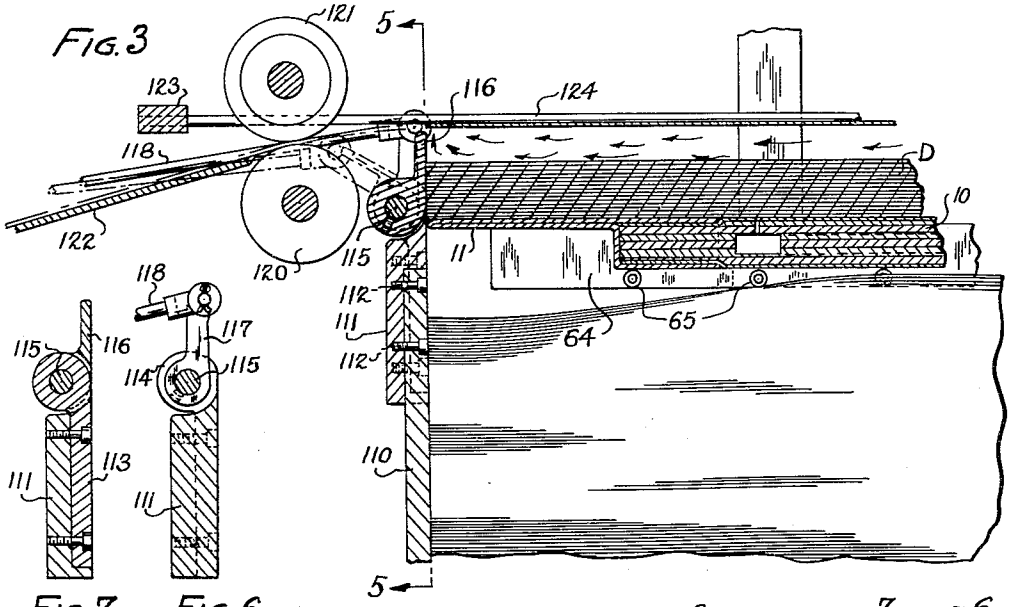


FIG. 7

FIG. 6

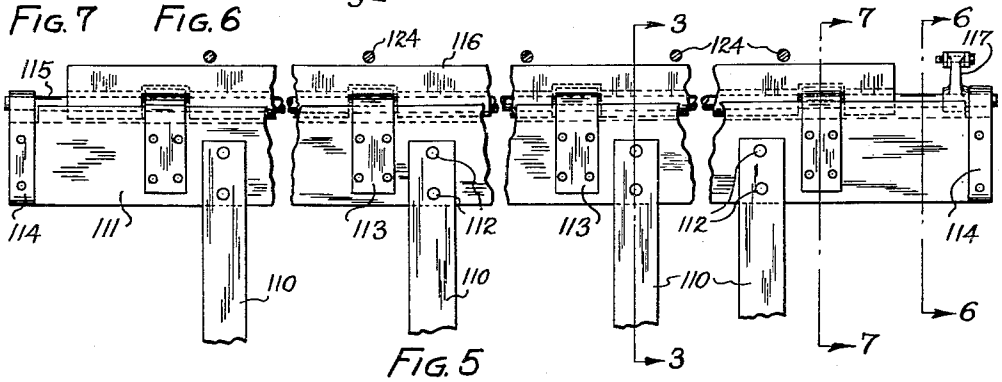


FIG. 5

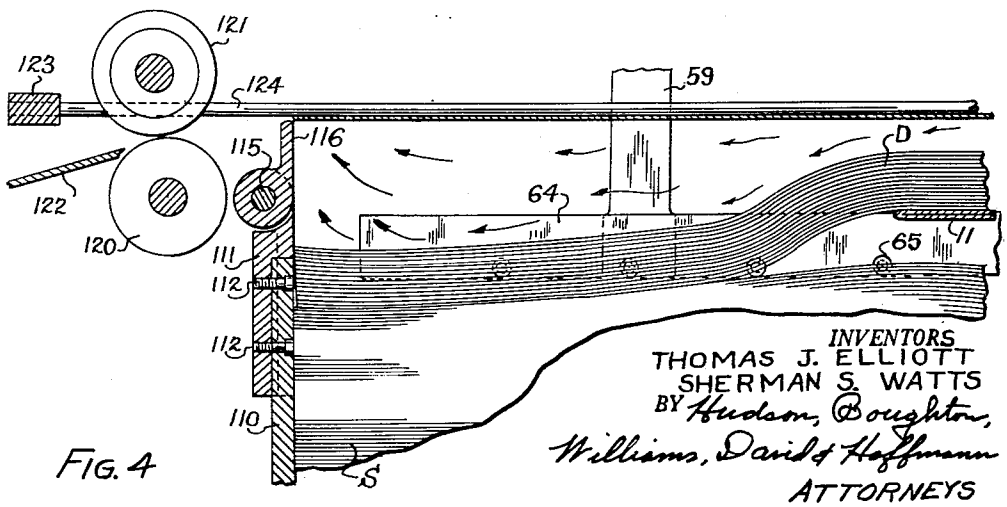


FIG. 4

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METHOD AND MEANS FOR FEEDING SHEETS

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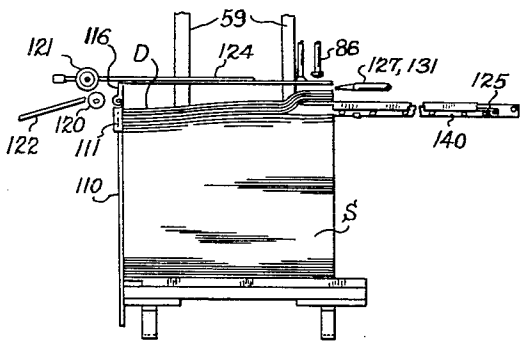


FIG. 8

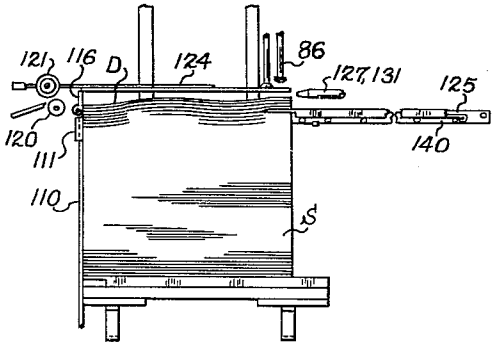


FIG. 9

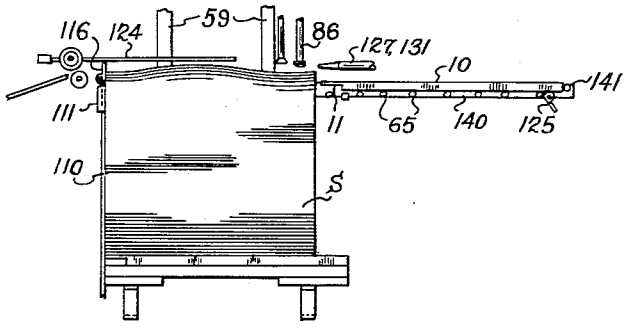


FIG. 10

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METHOD AND MEANS FOR FEEDING SHEETS

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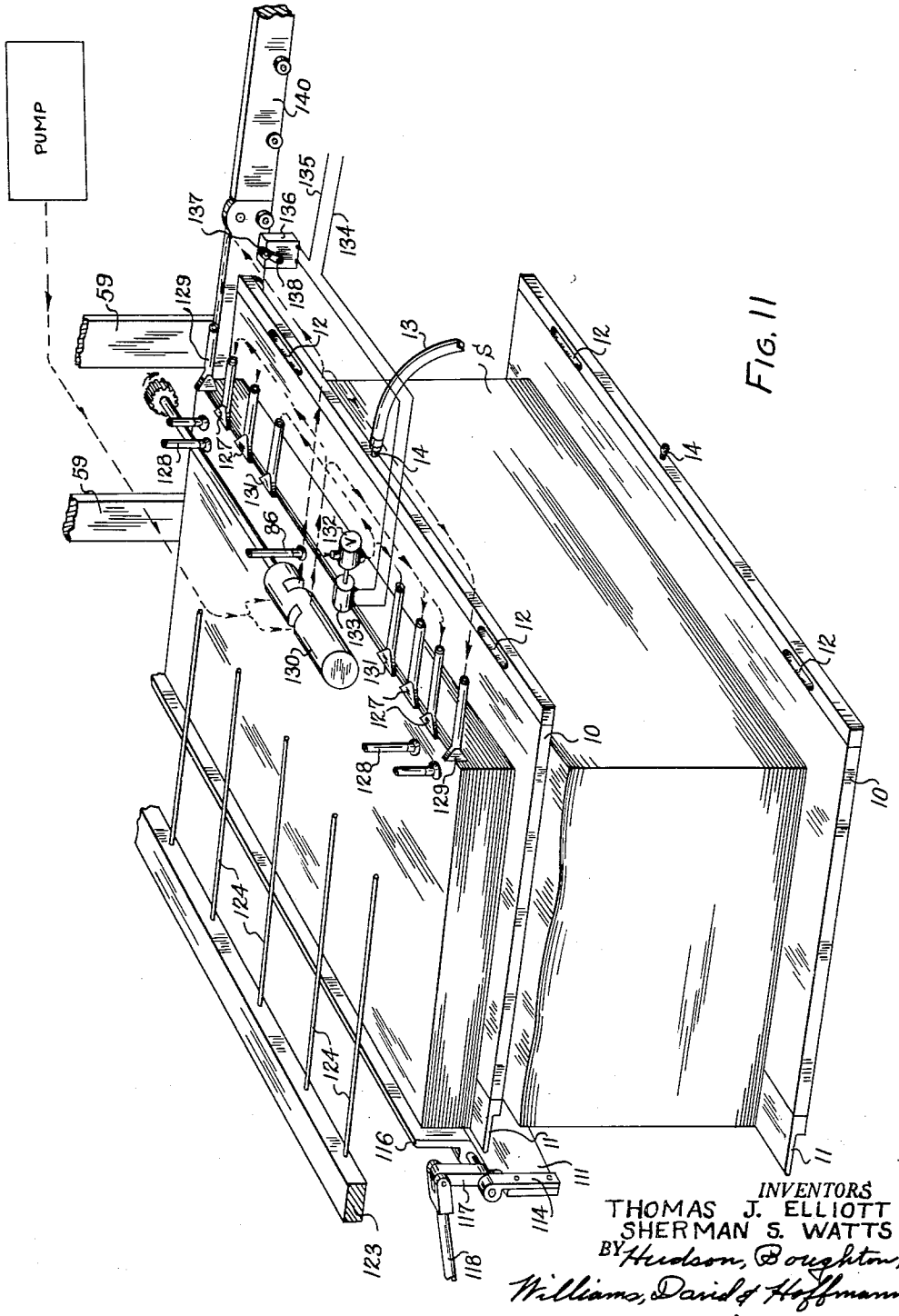


FIG. 11

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United States Patent Office 3,006,635 Patented Oct. 31, 1961

3,006,635
METHOD AND MEANS FOR FEEDING SHEETS

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Filed Dec. 13, 1957, Ser. No. 702,604
19 Claims. (Cl. 271—30)

This invention relates to improvements in pile feeders, especially feeders which may be operated continuously or without interruption when a new pile is brought into position beneath a depleted pile and the depleted pile is combined with the new pile.

The invention is in the nature of an improvement upon Schmidt et al. Patent 2,701,136, issued February 1, 1955, and may utilize a pallet disclosed and claimed in the copending application of Arthur G. Royer, Serial No. 698,430, filed November 25, 1957, now U.S. Patent No. 2,950,107.

The present invention provides a method and means for feeding sheets from a depleted pile during the operation of depositing the depleted pile onto a main pile that has been brought into position beneath the depleted pile, the feeding of sheets proceeding with the use of conventional lifting and feeding suckers even though the forward portion of the depleted pile is lowered a substantial distance equal at the very least to the thickness of the pallet withdrawn from beneath the depleted pile.

One of the important features of the invention is the provision of means for confining the air driven forward beneath the uppermost sheet during the shift of operation from the depleted pile to the combined piles so that force is built up beneath the sheet to lift it the necessary distance to bring it into the same path or plane of travel that the uppermost sheet occupies during the normal operation of the feeder.

One of the objects of the invention therefore is the provision of a method and means for feeding sheets continuously at the time of shifting control of the feed from a depleted or auxiliary pile to a new or main pile.

Another object is the provision of means for lifting a top sheet a distance greater than normal during the short interval occupied by the shifting of feed from the depleted pile to the new pile.

Another object is the provision of means for increasing the volume of air introduced beneath the uppermost sheet at the commencement of the deposit of the depleted pile onto the main pile and during the raising of the latter to bring the combined piles up to the regular or normal level of sheet feed.

Still another object is the provision of means for automatically controlling the supply of an extra volume of air beneath the uppermost sheet upon withdrawal of the pallet, particularly by means of an electric valve controlled by the pallet as it is withdrawn to lower the depleted pile onto the main pile.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application we have illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevational view of a pile feeder embodying the invention;

FIG. 2 is a rear elevational view of the same;

FIG. 3 is a longitudinal sectional view on a larger scale showing normal feeding from a depleted pile before the pallet is withdrawn, the view being taken substantially on the line 3—3 of FIG. 5;

FIG. 4 is a similar view after the pallet is withdrawn to an extent that is limited by a stop provided for the purpose, the view being taken substantially on the line 3—3 of FIG. 5;

FIG. 5 is a transverse sectional view taken substantially on the line 5—5 of FIG. 3, illustrating the upper portions of the stack gauges, the baffle and the flap, all as referred to hereinafter;

FIGS. 6 and 7 are detail sectional views taken substantially on the lines 6—6 and 7—7 of FIG. 5;

FIGS. 8, 9 and 10 are diagrammatic views illustrating different positions of the pallet as it is being withdrawn from beneath the depleted pile, and

FIG. 11 is a diagrammatic perspective view illustrating air blast means used for fluffing up the rear corners of the sheets to assist sheet separation, means for introducing streams of air beneath the uppermost sheet for floating the same during normal feeding, and additional streams or blasts of air while the pallet is being withdrawn.

The general problem or plan of the present invention follows that described in the aforesaid Schmidt et al. patent, that is to say, a pile of sheets supported on a pallet is carried upon transverse bars or beams which are hung from four (4) cables which are reeled up gradually an increment at a time by mechanical means which is controlled by a feeler or pile height gauge which functions to maintain the pile at such height that its top sheet will lie at the proper level to be acted upon by the usual sheet separating and feeding means.

The sheets in the pile are gradually used up and when the depleted pile is reduced to a predetermined extent, an auxiliary mechanism supported from overhead is caused to move in beneath the side edges of the pallet, the feed of sheets continuing without interruption, and the elevation of the depleted pile being taken over by the auxiliary mechanism to maintain the top level constant or substantially so.

As soon as the auxiliary mechanism begins to function the cables are lowered and a new pile stacked upon another pallet is hung upon the cables, after which the latter are reeled up under manual control to bring the top of the new pile in close proximity to the first named pallet. This pallet is then withdrawn, which may be done without any considerable effort because of the support of the pallet upon antifriction means and because of the introduction of a film of air between the pallet and the bottom sheet of the depleted pile. The first stage of withdrawal of the pile leaves the forward end of the pallet, which is of thin section, overlying but separated from the top of the new pile. As the pallet is withdrawn the forward end of the depleted pile is lowered onto the main pile, the drop being through a distance equal to or slightly greater than the thickness of the main portion of the pallet, while the rear end of the depleted pile remains supported by the thin section of the pallet. During this interval control of the height of the rear end of the depleted pile as sheets are fed continues to be effected by the auxiliary mechanism, so that sheet feeding may be continued without interruption.

The pressman now operates by manual control the lifting mechanism for the new or main pile until the top sheet of that pile contacts and engages the thin forward section of the pallet. He then operates controls which cause the elevating mechanism for the main pile to come into operation for lifting the combined piles an increment at a time in the regular and conventional manner. The operator now completes the withdrawal of the pallet which means merely the withdrawal of its thin forward section. This section may be of the order of one eighth of an inch in thickness. The rear part of the

depleted pile is thus lowered a very small amount, which is well within the capacity of the conventional lifting suckers of the sheet feeding means.

The present invention has to do with means for floating the top sheet of the depleted pile when the forward portion thereof has been lowered by withdrawal of the pallet. The floating of the top sheet must be such as to lift that sheet into the regular plane of travel off the pile, or through a distance that has not been encountered heretofore in a pile feeder. This we have accomplished by providing a transverse baffle and a hinged flap, flush with the stacking gauges for the front of the pile, which baffle and flap confine the air and cause it to build up volume sufficient to lift the sheet into the plane of feed. We may also increase the volume of the air injected beneath the sheet during the short time the forward end of the depleted pile is lowered.

The pallet is illustrated generally at **10**. It is constructed of a relatively light but strong material and has a smooth upper surface. It may have a thickness of approximately one inch throughout the greater part of its extent. At its forward end it is provided with a thin transverse section, flush with the upper surface of its major portion. At the rear it may have hand holds **12**. Means are provided for introducing a volume of air between its upper surface and the bottom sheet of the pile which it supports. Passages within the pallet have ports extending through the upper surface which may be supplied with compressed air from a hose **13** that may be removably joined to a metal hose connection **14** at the rear end of the pallet.

FIGS. 1 and 2 show the invention embodied in a machine similar to that of the aforesaid Schmidt et al. patent. In this machine the feeder frame comprises uprights **23** and **24** and overhead frame members **25**. Each of the overhead frame members carries a pair of sheaves **26** and **27** over which run cables **28** and **29**. Each of the two cables **28** extends from sheave **26** directly to a winding drum **30**, of which there are two, while each of the cables **29** runs from its sheave **27** over second sheave **31** and thence down to one of the drums **30**. The lower ends of these four cables are secured to stirrups **32** which may be slipped over the flat ends of I-beams **33** that together constitute the carriers for the main pile support.

The latter support may be in the form of a skid which comprises four legs **34** that are attached in pairs to heavy planks **35** which are secured to transverse bars or other platform material **36**. On top of the skid there is placed a strong and relatively light weight pallet **10** upon which the sheets "S" are piled. Pallet **10** extends rearwardly of the pile as shown in FIG. 1. The hand holds **12** may be formed in or upon this rear end part of the pallet.

Turning with each of the two drums **30** there is a worm wheel **37** which meshes with one of a pair of worms which are fixed to a shaft **38** journaled in the frame of the machine. The shaft may be turned continuously in one direction by conventional means to operate the drums **30** for lowering or raising the I-beams **33**, or it may be turned intermittently in one direction for elevating the I-beams an increment at a time, also by a conventional means.

Four brackets **40** are mounted upon and extend upwardly from the overhead frame members **25**. In these brackets four vertical shafts **41** are rotatably mounted. The lower portions of these shafts are threaded as appears in FIG. 1. On their upper ends are bevel gears **42**. The brackets **40** also carry bearings for two shafts **43** upon which are fixed bevel gears **44**. On the forward ends of shafts **43** there are bevel gears **45** which mesh with bevel gears **46** on a transverse shaft **47**, at one end of which there is a worm wheel **48** that is driven by worm **49** which is keyed to the shaft of a small electric motor **50** supported upon one of the frame members **25**.

As a part of the overhead auxiliary pile support there is provided a pair of transverse rails **51**. These rails extend into the brackets **40**, where they carry nuts **53** which receive the threaded parts of the shafts **41**. Consequently, when the screw shafts **41** are turned in one direction or the other the rails **51** are raised or lowered. The operation is uniform throughout since the screw shafts are identical and are driven at the same rate of speed. Spaced inwardly somewhat from the ends of the rails, racks **55** are rigidly attached thereto, the teeth of the two racks at each side of the machine being accurately aligned.

Longitudinal shafts **56** have pinions **57** keyed thereto which pinions mesh with the racks **55**. Depending from each of the shafts **56** are two hangers **59** which are metal straps that are mounted upon the shafts by means of pillow blocks **60** that are bolted to the straps. Preferably the upper ends of each pair of straps are rigidly interconnected by a bar **61**.

In order to prevent the hangers from swaying on shafts **56**, a horizontal bar **62** is set into a recess in each strap **59** and secured thereto as by welding, and this bar carries near its ends studs upon which are journaled rollers **63** that bear against the under surface of rail **51**.

Secured to the lower ends of each pair of straps **59**, there is a track member **64**. These tracks carry on their inner sides a series of antifriction rollers **65** upon which the pallet is adapted to rest or move.

The two sets of hangers carrying the tracks **64** are interconnected for simultaneous operation to move the hangers inwardly or outwardly as indicated by the full and dotted line positions of FIG. 2. Means for accomplishing this purpose may comprise rods **67** and **68** attached at their outer ends to the hangers and having racks **69** and **70** at their inner ends which engage and mesh with the upper and lower sides of a pinion **71** that is fastened upon a shaft **72** which is supported in suitable bearings carried by the two rails **51**. The rear end of the shaft is provided with a hand wheel **75** for convenient manual operation.

When the rods **67** and **68** are pulled inwardly this pull is transmitted to the two rear straps **59** and thence to the shafts **56**, and because the pinions **57** are keyed to these shafts the pinions travel along the racks **55** and maintain parallel the two shafts **56** and the tracks **64** depending therefrom.

The elevating mechanism for the main pile comprises a pair of drums **30** previously described. On the shaft **38** which carries the two worms that mesh with the worm wheels **37**, there is keyed a ratchet wheel **76**. The pawl **77** cooperating with the ratchet is pivoted on one end of lever **78** that is mounted to oscillate upon the shaft **38**, being operated by a link **79** connected at one end to the lower end of the lever and at the other end to a crank **80** on a disc **81** which turns once for each sheet fed. Pawl **77** carries a roller **82** which is adapted to run upon a curved track **83** which forms a part of a masking lever **84** that is pivoted to the frame at **85**. Obviously when the lever **84** is swung down somewhat the pawl **77** will advance the ratchet **76** one step for each oscillation of the lever **78**, but when the lever **84** is raised to the extent illustrated in FIG. 1 the roller **82** merely rides back and forth on the masking track **83** and the ratchet remains stationary.

When the main pile elevating mechanism is in operation, as it is during the major part of the time, mechanical means disclosed with some particularity in the Schmidt et al. patent referred to above is provided for enabling the height gauge to control the vertical movements of a rod **110'** connected to the masking lever **84**. When the pile is high enough, the gauge cannot descend to its full working stroke and it prevents rod **110'** from descending far enough to permit pawl **77** to advance ratchet **76**. When, however, the pile level is low enough rod **110'** descends accordingly and the ratchet is advanced at least one step, raising the pile.

There is disposed above the rearward edge of the pile of sheets a height gauge **86** which moves up and

down for each cycle of the feeder. The maximum movement of the height gauge is accomplished only when the height of the pile does not interfere with or limit the motion of the gauge.

The mechanism by means of which the height gauge **86** is reciprocated is not fully disclosed herein as it forms no part of the present invention. Furthermore it is disclosed in detail in the Schmidt et al. patent referred to above. This mechanism also causes movement of one arm **88** of a bell-crank lever, the other arm **89** of which carries electrical contact means that induces momentary energization of the motor **50**, whenever the height gauge permits the arm **89** to descend sufficiently.

The elevation of the auxiliary pile support is thus effected by the small motor **50**. The control is such that the circuit for the motor is closed momentarily only and the rotation of the motor shaft while the current is on plus the coasting of the motor rotor thereafter is sufficient to raise the auxiliary pile support appreciably.

The motor circuit is indicated diagrammatically in FIG. 1. It comprises a switch **105** operated by a push button **106** when the bell crank arm **89** descends sufficiently. The circuit from line wires **107** and **108** also includes a switch **109** which is normally open but is closed when the control for the motor is to be employed, that is when the feed of sheets is taking place from the depleted pile carried by the auxiliary support.

It will be apparent that when the level of the pile descends sufficiently the height gauge travel will permit the bell crank arm **89** to descend far enough to close switch **105** for an instant, which will result in a short operation of motor **50** to raise the level of the pile. The succeeding oscillations or reciprocations of the height gauge, being of a smaller extent, will not operate switch **105** until the height of the pile again descends far enough to cause push button **106** to be depressed.

Referring now to FIGS. 3 to 7 inclusive, there are provided for the forward end of the pile a series of fixed stacking gauges **110** against which the forward edges of the sheets bear, being urged in that direction by the somewhat inclined positions of the cables **28** and **29**. A transverse baffle **111** is attached to the upper ends of the stacking gauges **110** in a manner to be flush with the rear surface of the gauges. Fastenings to hold these parts together in rigid relationship are indicated at **112**. The baffle **111** extends laterally somewhat beyond the side edges of the pile as indicated in FIG. 11. At intervals along the length of the baffle **111** hinge plates **113** are set into recesses in the baffle flush with the rear surface of the latter. Somewhat similar plates **114** are mounted at the extremities of the baffle. The upper ends of these hinge plates receive rotatably a hinge pin or shaft **115** upon which is fixedly mounted a flap **116** that is recessed to take the upward protruding portions of the hinge plates **113**. As indicated in FIG. 3 the baffle **111** and the flap **116** have arcuate meeting surfaces, so that as the flap **116** swings from the full line to the broken line position of FIG. 3 a close joint between them is maintained and the escape of air through the joint is held to a minimum. The shaft **115** is rocked back and forth between the positions indicated in FIG. 3 by a crank **117** and a rod **118** which is reciprocated once for each cycle of the machine.

A pair of pull-in rolls of conventional form are disposed in advance of the forward end of the pile, including a driven roll **120** and a series of idler rolls or wheels **121**. These rolls **120** and **121** are adapted to take sheets one at a time from the top of the pile and advance them over a feed board **122**. Transverse bar **123** is mounted in the machine frame in advance of the feed-in rolls. It carries a series of rearwardly extending rods or fingers **124** disposed between the wheels **121** and just above the flap **116** when the latter is in its up position indicated in full lines in FIGS. 3, 4 and 5.

A depleted pile supported upon pallet **10** is indicated at "D." In the regular cycle of the sheet separating and feeding means the uppermost sheet is taken by the lifting suckers **142** and transferred to forwarding suckers **128** which are then stationary, constituting sheet holding means. Streams of air are then discharged beneath the sheet by air nozzles **127** which float the sheet up against the fingers **124** as indicated in FIG. 3. Suckers **128** now start forward, advancing the sheet. Then the flap **116** swings to its forwardly inclined down position shown in dotted lines while forwarding suckers **128** advance the sheet into the bite of pull-in rolls **120, 121**.

When the first stage of the withdrawal of the pallet is effected after a new pile has been raised into close proximity with the pallet, its rear end is caused to engage a releasable stop **125**. The forward end of the depleted pile is thus caused ot drop onto the main pile, as illustrated in FIG. 4. The depth of the baffle **111** is such, and its elevation is such, that when this occurs the top sheet of the depleted pile will never descend below the baffle. The rear end of the depleted pile remains as before, being supported upon the thin section **11** of the pallet. The top of a new pile is sometimes not level, particularly where the sheets have been previously printed in one or more colors. Such a condition is illustrated in FIG. 4. In that event the forward end of the depleted pile may fall a distance greater than the thickness of the pallet. After the depleted pile is thus lowered onto the main pile it is necessary, in order that feeding may continue without interruption, that the uppermost sheet be raised at each cycle to a much greater extent than would be otherwise required. This considerable lifting of the top sheet is accomplished in our construction by the fact that at the forward end of the pile a confining wall, consisting of baffle **111** and up-turned flap **116**, causes the volume of air under the top sheet to build up so as to raise the top sheet into contact with the fingers **124** and thus to enable the sheet to be fed forward over the flap when the latter is swung into its forwardly inclined down position. Unavoidably some air is lost by lateral flow at the sides of the pile, but the amount is relatively small especially in the case of a pile of large sheets where the width of the sheets may be of the order of six feet.

As an additional measure, we may in some cases increase the volume of the air during the time that the depleted pile is lowered. A provision for increasing the volume of air before the main pile is raised into contact with the thin section **11** of the pallet is illustrated in the schematic view of FIG. 11. In this view air from a pump or other supply is delivered to a rotary valve **130** which controls the supply to fluffing up nozzles **129** at the rear corners of the pile and to the nozzles **127** previously mentioned for the regular cycling of the feeder. An additional pair of nozzles **131** are fed through a supplemental valve **132** which is opened when the solenoid **133** is energized. The solenoid may be energized from line wires **134, 135** by an electric switch **136** which is normally opened. When the pallet is first moved rearwardly it engages a wheel **137** on a switch lever **138** to close the switch, which continues to be closed until the end of the second stage of pallet withdrawal is reached, when the pallet will have been drawn rearwardly of the wheel **137** and the switch will open again. In this manner the supply of an additional volume of air is effected automatically. It will be appreciated that instead of supplying an additional volume of air through nozzle **131** means for increasing the volume of the air supplied through nozzles **127** could be defined, and such means are deemed to be within the purview of the invention.

The tracks **64** are made with extensions **140** which may be swung up into the positions shown in FIG. 1 so as to be out of the way. In the diagrammatic views of FIGS. 8, 9 and 10 they are shown down in their operative position.

In FIG. 8 the depleted pile "D" has been partially lowered onto the main pile "S," the rear extremity of the pile

being supported on the thin section **11** of the pallet beneath the height gauge **86**.

The next step in the method is the raising under manual control of the main pile 'S" until it engages the thin section **11** and lifts the forward end portion of the depleted pile so that the two piles are now combined except where they are separated a very small distance at the rear by the thin section **11**, as in FIG. 9. Up to this time, the feed of sheets has been from the depleted pile by the auxiliary mechanism driven by motor **50**. The operator now quickly operates controls to disconnect motor **50** and to resume means for elevating the main pile an increment at a time. He may then swing stop **125** down as illustrated in FIG. 10 and pull the pallet back in the second stage of its movement until it encounters a fixed stop **141** when the thin section **11** of the pallet will be completely withdrawn from the pile and the two piles will be combined throughout their extent.

It is to be understood that the type of pallet shown and described is merely representative of one kind that may be used. Obviously a blunt-ended pallet rather than one with a thin forward portion will perform exactly the same as far as the front of the pile is concerned.

In some instances, it is desirable to provide separate air pumps for the nozzles **127** and **131**. In such a case the second or auxiliary pump will have a line directly to the solenoid-operated valve **132** and an additional switch will be placed in series with the switch **136**. This extra switch will be timed with the press to permit air to reach the nozzles **131** at the same time the rotary valve **130** opens the lines to the nozzles **127**, but only, of course, when the switch **136** is also closed during withdrawal of the pallet.

Having thus described our invention, we claim:

1. In a sheet feeder, stacking gauges for the forward edges of a pile of sheets, a transverse baffle at the upper ends of the stacking gauges flush with the rear faces thereof, a pair of pull-in rolls disposed forward of and slightly above said baffle, a hinged flap adjoining the upper edge of said baffle having an up position flush with the rear surface of the baffle and a forwardly inclined down position for guiding a sheet into the bite of said rolls, means for separating and raising an edge of the top sheet above the pile, means for directing a blast of air forward beneath the raised edge of the top sheet while said flap is in said up position whereby the air blast builds up force behind the baffle and flap to float the remainder of the sheet upwardly above the pile, stop means to prevent the sheet from being blown up substantially above the flap when in its up position, means for turning said flap to its down position once during each cycle, and means for feeding the air-supported sheet forward over said down-turned flap into the bite of said pull-in rolls.

2. In a sheet feeder, stacking gauges for the forward edges of a pile of sheets, a transverse baffle at the upper ends of the stacking gauges flush with the rear faces thereof, a pair of pull-in rolls disposed closely forward of and slightly above said baffle, a hinged flap adjoining the upper edge of said baffle having an up position flush with the rear surface of the baffle and a forwardly inclined down position for guiding a sheet into the bite of said rolls, said feeder being operable while the front top edge of the pile is maintained between an upper limit at which it is close to the top of the flap and a lower limit at which it is below the flap but above the bottom of the baffle, means for separating and raising the rear edge of the top sheet of the pile, means for directing a blast of air forward beneath the raised edge of the top sheet while said flap is in said up position to float the sheet upwardly above the pile, stop means above the pile along its front portion to prevent the sheet from being blown up substantially above the bite of the pull-in rolls, means for turning said flap to its down position once during each cycle, and means for feeding the air supported sheet forward over said downturned flap into the bite of said pull-in rolls.

3. The invention set forth in claim 2 wherein said feeder is a continuous feeder comprising main and auxiliary pile supports and a pallet for supporting a depleted pile of sheets on said auxiliary support, and wherein the lower limit of the top of the depleted pile is reached only when the pallet has been withdrawn to deposit the depleted pile on a new pile.

4. In a sheet feeder, stacking gauges for the forward edges of a pile of sheets to be fed, elevating means maintaining the top of said pile at approximately a predetermined level, a transverse baffle at the upper ends of the stacking gauges flush with the rear faces thereof, a pair of pull-in rolls disposed forward of and slightly above said baffle, a hinged flap adjoining the upper edge of said baffle having an up position flush with the rear surface of the baffle and a forwardly inclined down position for guiding a sheet into the bite of said rolls, means for separating and feeding forward one after another the top sheets of said pile, said feeding means comprising means for directing streams of air forward beneath each top sheet after it is separated, means for preventing the uppermost sheet from being blown up above the said flap, said elevating means including means supporting said pile and operable to lower the forward portion and then the whole of said pile onto a new main pile disposed beneath the first-mentioned pile and elevatable by said elevating means, the first-mentioned pile dropping below said level when lowered onto said main pile, means for thereafter exerting greater than normal pneumatic force under each sheet to compensate for the greater upward distance through which each sheet must travel to reach the approximate elevation of said pull-in rolls while the first-mentioned pile is lowered and the main pile is being elevated to raise the combined first-mentioned pile and main pile, and for again reducing the pneumatic force to normal when the main pile has been raised to bring the top level of the combined piles to approximately said predetermined level.

5. A feeder as defined in claim 4 wherein the means for exerting the greater than normal pneumatic pressure comprises automatic means for starting the increased pneumatic force when the rearward lowering of the depleted pile is begun and for turning off said increased pneumatic force when the main pile has been elevated to engage the depleted pile throughout substantially its full extent.

6. A sheet feeder as defined in claim 4, wherein the means for turning on and off the additional volume of air comprises an electric switch with a control lever extending into the path of the pallet adapted to be actuated during the withdrawal of the pallet up to the time the pallet reaches the position in which its thin section only overlies the main pile.

7. In a device for continuously feeding sheets from the tops of piles thereof to a sheet-handling machine, main pile raising mechanism, auxiliary pile raising mechanism, stacking gauges against which the front of each pile is urged while being raised, pull-in rolls forward of and near to the front edge of the pile and having their bite slightly above the normal top level of the pile, sheet separating and forwarding means operating at the rear of the pile for raising the rear edge of each sheet and forwarding the raised sheet to the bite of the pull-in rolls, a flap extending along the front top edge of the pile, said flap being pivotal on a horizontal axis from a first position in which the flap guides sheets to the bite of the rolls to a second position in which it maintains the front of the pile in vertical alignment with the stacking gauges, air blast means at the rear edge of the pile directing air under pressure forwardly below a raised sheet to float the sheet and thereby assist its entrance into the bite of the pull-in roll means, means operating said main and auxiliary pile raising mechanisms first to raise a pallet-supported pile with the main mechanism, next when the pile has been depleted substantially to support the pallet and depleted pile by said auxiliary raising mechanism while a new pile is placed on and supported by the main raising mecha-

nism, then to operate said main raising mechanism until the top of the new pile comes in close proximity to the bottom of the pallet supporting the depleted pile, pile height control means for said operating means normally maintaining the top level of the top pile a short distance below the top of said flap when said flap is engaging the pile, and baffle means below the flap and forming a generally unbroken surface therewith across the width of the pile and a distance below the top to the pile sufficient that the top of the depleted pile, when the pallet is withdrawn, will remain above the bottom of the baffle means, whereby the floating air from said air blast means when directed against the baffle and flap, raises the front edge of each sheet sufficiently high to enter the bite of the pull-in roll means to compensate for a temporary drop in the top level of the pile below the flap when the pallet is withdrawn.

8. In a sheet feeder, stacking gauges for the forward edges of a pile of sheets, a pair of pull-in rolls disposed closely forward of and slightly above the stacking gauges, transverse baffle means extending above the stacking gauges and being flush with the rear faces thereof, the top edge of said baffle means being approximately at the level of the bite of the pull-in rolls, said feeder being operable while the front top edge of the pile is maintained between a normal feeding level approximately at the top of the baffle means and a level substantially below the top of said baffle means, means separating and holding the top sheet of the pile, first means for directing a blast of air forward beneath each separated sheet once for each sheet fed when the top of the pile at the front edge is at its approximate normal feeding level, stop means above the pile along its front portion to prevent the sheet from being blown up substantially above the bite of the pull-in rolls by said first air blast means, and second means for directing a blast of air forward beneath a separated sheet in addition to the first means when the top front edge of the pile is at or near its lower feeding level whereby said additional air on reaching said baffle means assists the first means in floating the sheets to the stop means.

9. The invention according to claim 8 wherein the feeder is a continuous feeder including main and auxiliary pile supports and a pallet supported by the auxiliary support, withdrawal of said pallet to deposit a depleted pile on a new pile causing a change of the top of the depleted pile from its high to its low limit.

10. The invention according to claim 9 including means operated by a pallet during withdrawal for controlling the second air blast means.

11. The invention according to claim 10 including means timing the first and second air blast means to come on at substantially the same time during pallet withdrawal.

12. A method of continuously feeding sheets from a depleted pile in a horizontal plane directed toward a pair of pull-in rolls, which consists in lowering the forward portion of the depleted pile onto a main pile supported beneath the depleted pile, providing a partially closed space above the front of the lowered depleted pile, separating the rear edge of the uppermost sheet from the pile, forcing a blast of air under the separated sheet and forward into the said partially closed space, whereby the sheet forms an upper closure for the said space and is floated upwardly into the said plane, preventing the sheet from rising above said plane, and continuing the feeding of sheets one after another from the top of the depleted pile while the main pile is being raised toward and into contact with approximately all of the depleted pile, and thereafter continuing the feeding of sheets from the top of the thus combined piles.

13. In a sheet feeder, a separating and feeding mechanism for feeding sheets to pull-in rolls from a substantially horizontal feed position above a pile of sheets and including elevating means for maintaining the top of said pile at a normal feeding level below said feed position and at which level the top sheet is adapted to be engaged by means for raising one edge of the top sheet, at least portions of the top of said pile falling below said level during normal operation of the feeder, the combination of first means providing an air blast beneath the top sheet when the said one edge thereof is raised to float the remainder of the sheet upwardly to a substantially horizontal position, means limiting the upward movement of said sheet to said feed position, means for providing an additional volume of air under pressure below the raised top sheet when portions of said top sheet fall below said level during the operation of said feeder, and control means for the last said means normally rendering the last said means ineffective and actuatable upon the dropping of the top sheet of the pile below said level to render the last said means effective.

14. In a sheet feeder having sheet separating and feeding mechanism for operating on a pile of sheets, each of which sheets has front and rear parallel edges, to raise one of said edges of the top sheet of the pile of sheets and thereafter feed the sheet forwardly to a pair of pull-in rolls adjacent to but outwardly of the top of the front side of the pile, said pile of sheets being supported on a pallet, elevating means for raising said pallet to maintain the top of the pile thereon at approximately a predetermined level, said elevating means being adapted to receive a new pile of sheets and to support the latter in a position below the pile on said pallet after the latter pile is partially depleted and to elevate the new pile, said pallet being withdrawable rearwardly to transfer the pile on the pallet onto the new pile progressively from the front edge to the rear edge thereof, said feeding means being operable during the withdrawal of said pallet, the combination of first means for directing a blast of air underneath a sheet having one edge thereof raised by said separating and feeding means to float the sheet upwardly to a sheet feeding position, means for limiting the upward movement of the air-floated sheet to said sheet feeding position, second means for providing an increased amount of air beneath said sheet during the pallet withdrawal operation, and control means for said second means normally rendering said second means ineffective and actuatable upon the start of pallet withdrawal to render the second means effective and upon the complete removal of the pallet to render the second means ineffective.

15. In a sheet feeder, the combination as defined in claim 14 wherein said sheet separating and feeding means raises the rear edge of the sheet and which combination further comprises baffle means extending across the front of the pile being fed at the top thereof, said baffle means extending above said predetermined level to provide a dam for the air for floating the sheet being separated and downwardly to below the level to which the sheets of the partially depleted pile drop upon withdrawal of the pallet.

16. In a sheet feeder, the combination as defined in claim 14 wherein said second means is controlled by means operated in response to the withdrawal of said pallet.

17. In the method of continuously feeding sheets wherein the pile being fed is supported on a pallet which is elevated to maintain the top of the pile at feeding height and which, when the pile thereon is approaching depletion, is withdrawn from the forward portion to the rearward portion of the pile to deposit the depleting pile onto a new pile disposed underneath the depleting pile and wherein the top sheets are successively separated from the pile being fed and are floated upwardly by an air blast to a feed position from which they are fed, the steps of restricting the escape of air from between the sheets along at least one side thereof adjacent the forward portion of the pile, and increasing the amount of air in the air blast during the pallet withdrawal operation to compensate for the falling of the sheet or portions thereof due to the withdrawal of the pallet.

18. In a system wherein top sheets of a pile of sheets are being separated from the pile and fed in a forward

direction along a horizontal plane with the pile being elevated as the top sheets are removed to maintain the top of the pile at an approximate level and wherein the pile is replenished by combining the pile from which the sheets are being taken with a new pile disposed therebeneath, the method which comprises the steps of separating the rear edge of the uppermost sheet of the pile from which the sheets are being taken, forcing a normal blast of air between the separated sheet and the next sheet once for each sheet to be fed, restricting the escape of air from between the separated sheet and the next sheet at least along the forward side of the pile to float the separated sheet upwardly to said plane, lowering the forward portion of the pile from which the sheets are being taken onto the new pile to initiate the combining operation, continuing the feeding of the sheets one after another during the combining operation and including the continuing of the blast of normal air once for each sheet fed but increasing the volume of air during the combining operation, elevating the new pile to raise the forward portion of the pile from which the sheets are being taken and to bring the new pile into contact with substantially all of the pile from which the sheets are being taken to effect a combining of the piles, and thereafter continuing the feeding of sheets from the top of the thus combined piles with the normal volume of air in the air blast for each sheet.

19. In the method of continuously feeding sheets wherein the pile being fed is supported on a pallet which is elevated to maintain the top of the pile at feeding height and which, when the pile thereon is approaching depletion, is withdrawn from the forward portion to the rearward portion of the pile to deposit the depleting pile onto a new pile disposed underneath the depleting pile and wherein the top sheets are successively separated from the pile being fed and are floated upwardly by an air blast to a feed position from which they are fed, the step of increasing the amount of air in the air blast during the pallet withdrawal operation to compensate for the falling of the sheet or portions thereof due to the withdrawal of the pallet.

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