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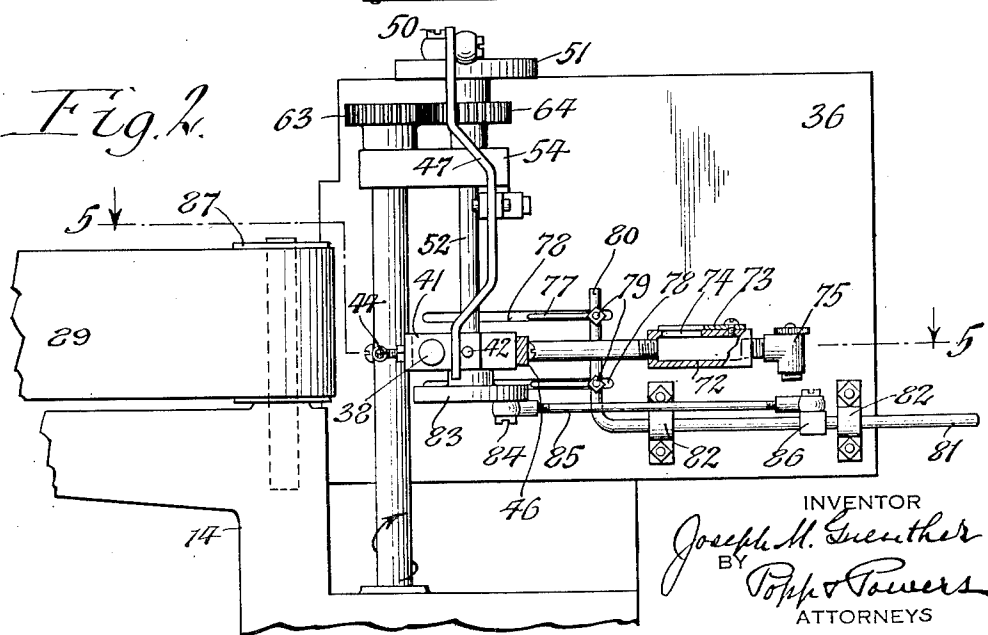
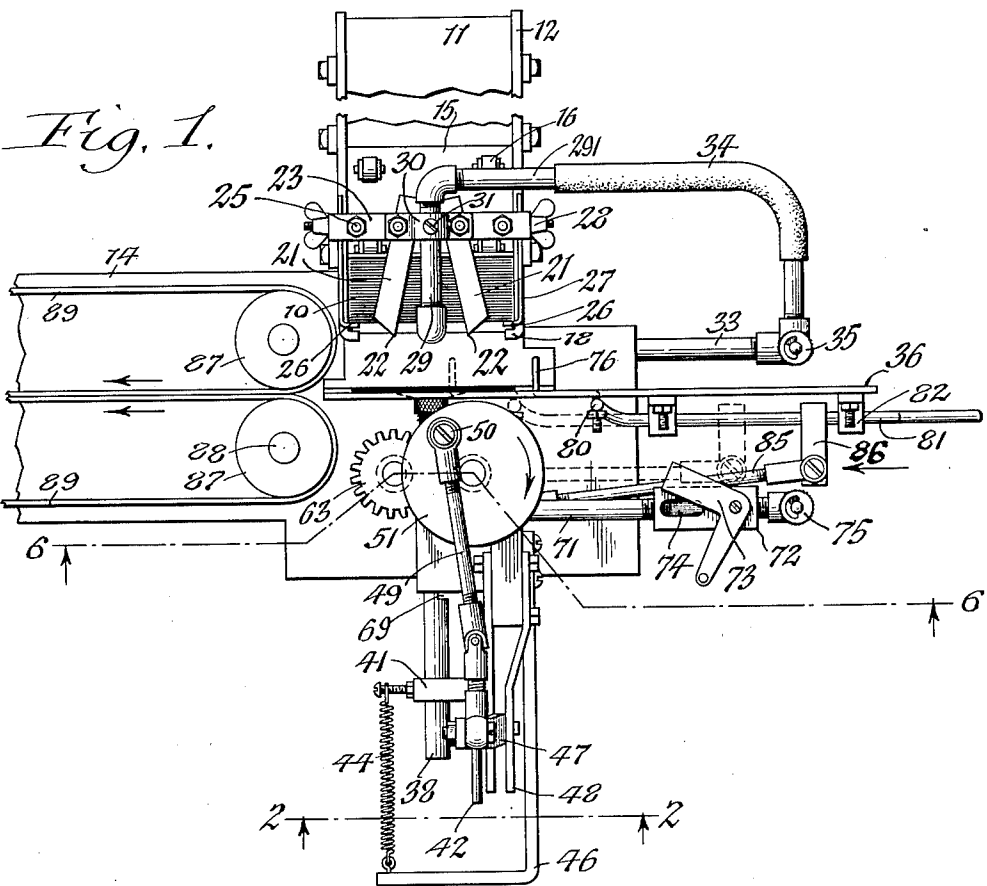
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1,979,153

CARD OR SHEET FEEDING MECHANISM

Filed Jan. 6, 1934

3 Sheets-Sheet 1



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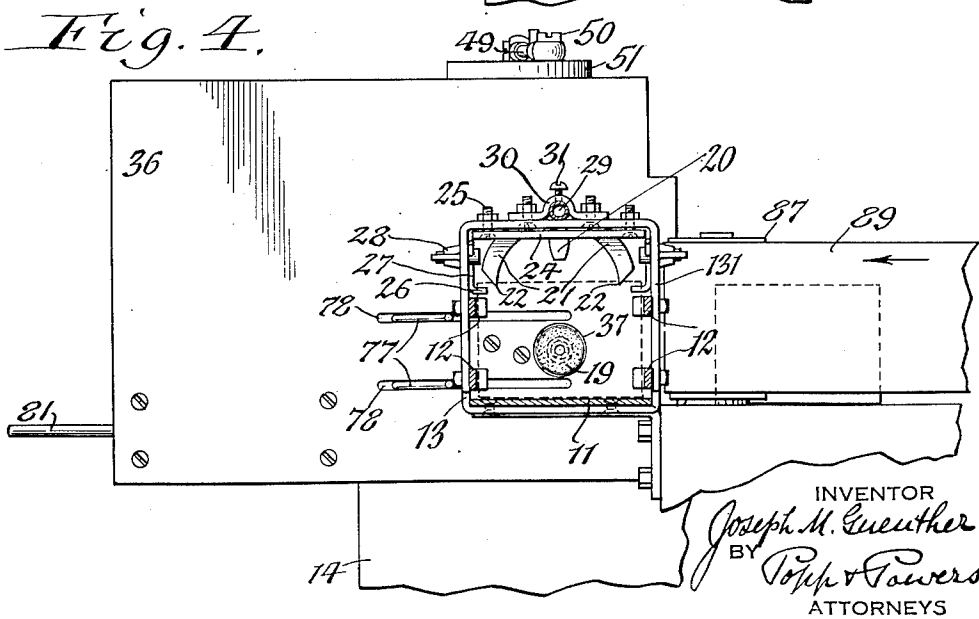
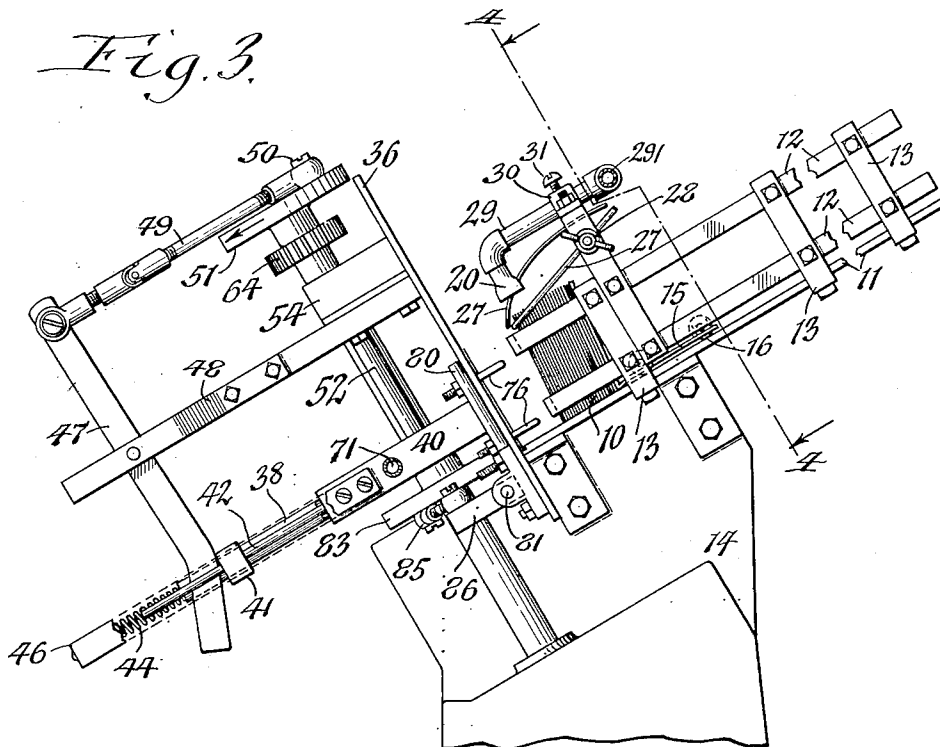
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3 Sheets-Sheet 2



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CARD OR SHEET FEEDING MECHANISM

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3 Sheets-Sheet 3

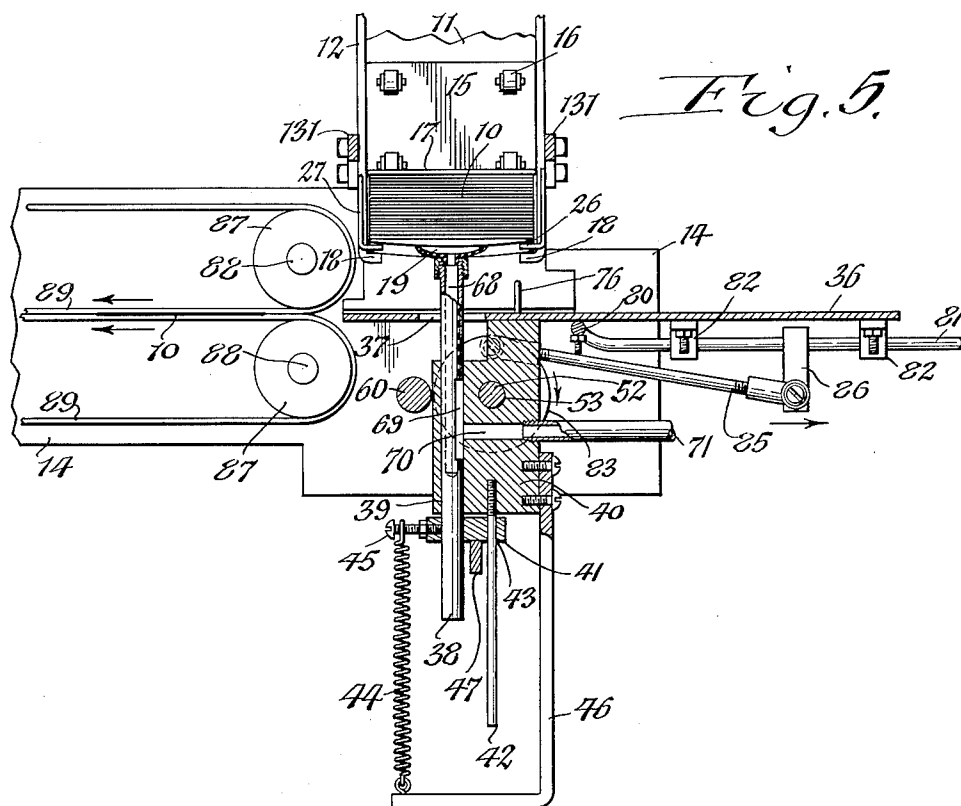


Fig. 5.

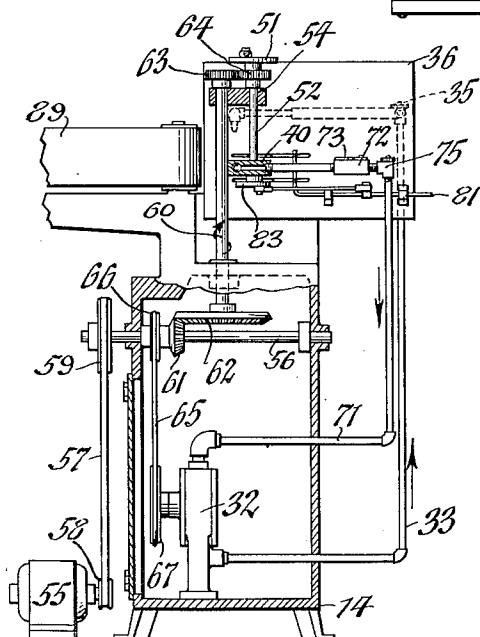


Fig. 6.

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1,979,153

CARD OR SHEET FEEDING MECHANISM

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Application January 6, 1934, Serial No. 705,555

3 Claims. (Cl. 271—32)

This invention relates to a machine for feeding sheet-like articles successively from a stack or pile to another machine which is adapted to receive or operate upon these sheets. Although this paper feeding machine is more particularly designed for feeding sheets of paper from a stack and delivering the same to a machine which wraps paper around loaves of bread or the like, this sheet feeding machine is also useful for feeding sheets successively from a stack to other machines which operate upon such sheets, such as printing presses, folding machines, letter cancelling machines and the like.

In the present case the sheets of paper which are fed from the stack may have printed thereon any suitable information either of an instructive, advertising, or other character, and when discharged from this feeding machine the same are inserted successively between the loaf of bread or the like and the wrapper in which the former is enclosed.

It is the object of this invention to provide a sheet feeding machine of this character which will reliably remove one sheet at a time from the stack and discharge the same to the machine adapted to receive the same, which is efficient and rapid in its operation, and which is comparatively simple in construction, not liable to get out of order and has all its parts easily accessible for inspection and adjustment.

In the accompanying drawings:

Figure 1 is a top plan view of a sheet feeding machine embodying my improvements.

Figure 2 is a front elevation of the same with the part thereof in section taken on line 2—2 Fig. 1.

Figure 3 is a side elevation thereof with a part broken away for the purpose of more clearly illustrating the same.

Figure 4 is a vertical section taken on line 4—4 Fig. 3.

Figure 5 is a horizontal section taken on line 5—5 Fig. 2.

Figure 6 is a vertical section on a reduced scale, taken on line 6—6 Fig. 1 and showing the mechanism for driving the various elements of the machine in unison and in timed relation from a single motor.

In the following description similar characters of reference indicate like parts in the several figures of the drawings:

In its general organization this machine comprises means for supporting a stack or pile of sheets so that each sheet is arranged in a substantially upright position and is supported at

its lower edge, means for separating the sheets successively from the pile at the front end of the same, and means for delivering or ejecting the sheets successively from the separating mechanism so that they will be received between the loaf and wrapper during the operation of wrapping loaves of bread or the like.

The sheets of paper which are to be fed by this machine may be of any desired shape and character, for example these sheets may be of oblong, rectangular form as shown by full lines at 10 in Figs. 1, 3 and 5 and by dotted lines in Fig. 4.

The support for the stack of sheets of this character includes a magazine or trough-like holder which has an inclined bottom 11 formed by a plate, and two side walls arranged along opposite edges of the bottom and an open top. Each of the side walls is preferably constructed of two longitudinal bars 12 arranged one above the other, and these are connected with the bottom by means of brackets 13 each of which extends along the underside of the bottom and the outer side of the bars 12, as best shown in Fig. 4.

This magazine is supported in an inclined position with its discharge or front end lowermost and for this purpose the front end of the magazine is secured to a main frame 14 which not only serves as a support for the working parts of the sheet feeding machine but may also form a support for the parts of the machine to which the sheets are delivered by the sheet feeder mechanism.

The stack of sheets or cards is arranged within this magazine so that the lower edges of the sheets rest on the bottom, and the vertical side edges thereof are close to the side walls of the magazine whereby the stack is guided from the rear end toward the front end thereof, as the sheets are fed off successively from the front end of this stack. As the feeding off of the sheets from the front end progresses the stack is advanced by sliding down the inclined bottom of the magazine by gravity aided, if necessary, by means of a follower which engages with the rear end of the stack. Although this follower may be of various forms the same preferably consists of a lower base 15 which is provided with a plurality of rollers 16 engaging with the bottom of the magazine, and an upright thrust plate 17 arranged at the front end of the base plate and engaging with the rear end of the stack, as best shown in Figs. 1, 3 and 5.

At its front end the magazine is provided with stop means which engage with the front side

of the stack of sheets adjacent to opposite vertical edges thereof, for the purpose of retaining the stack of sheets within the magazine and preventing discharge of the same at the front end of the mechanism excepting when the foremost sheet is operated upon by the separating mechanism, said stop means consisting preferably of stop lugs 18 arranged at the front ends of the side bars 12 and projecting inwardly into the path of the upright edge portions of the stack of sheets or cards in the magazine so that the forward movement of the latter under the action of gravity and the weight of the follower is arrested.

The means whereby the sheets are successively separated from the front end of the stack preparatory to delivering the same from the machine may be variously constructed, but in the present instance these means include a pneumatic gripper 19 having preferably the form of an elastic cup of rubber or the like which is movable lengthwise toward and from the central part of the stack of sheets at the front end thereof. During the backward movement of this pneumatic gripper air is exhausted from the same so that when it engages the central part of the foremost sheet or card in the stack the latter will adhere to this gripper, and this air exhausting effect upon the gripper is continued during the subsequent forward or return movement of the gripper so that the foremost card or sheet of the stack is separated or removed from the stack and carried forwardly therefrom to the forward part of the stroke of the gripper. During the last part of this forward stroke the exhausting effect upon the pneumatic gripper is broken so as to release the hold of the gripper on the separated sheet and permit the latter to be moved transversely therefrom to the mechanism which is adapted to utilize the separated sheet.

As the pneumatic gripper or suction cup adheres to the central part of the foremost sheet in the stack and this gripper moves forwardly or away from the stack, the central part of the foremost sheet is bulged forwardly, as shown in Fig. 5, and the opposite vertical edges thereof are sprung inwardly out of engagement from the stops 18 at the front end of the magazine, thereby separating the foremost sheet from the stack and permitting the stack to move forwardly so as to engage the next following foremost sheet with these stops. It has been found in practice that when feeding some kinds of sheets or cards the same do not separate readily one from another, and to facilitate this an air blast is delivered between the edges of the foremost sheets of the stack. In the present case this is accomplished by means of a nozzle 20 which is arranged over the front part of the magazine and is adapted to deliver a downward blast or jet of air against the upper side of the stack between the opposite vertical edges thereof adjacent to the foremost part of the stack, whereby the sheets or cards upon approaching the front or delivery end of the magazine, are loosened relatively to each other by the introduction of the stream of air between the same and thus aids in the operation of feeding one sheet or card at a time from the front end of the stack.

A further aid in preventing the feeding off of more than one sheet at a time from this stack consists of two resilient or spring fingers 21 having the form of curved strips of spring metal arranged above the magazine and stack

of sheets therein on opposite sides of the longitudinal center thereof, and each having a downwardly bent inner corner 22 which is adapted to be engaged by the upper edge of the sheets in the magazine at the discharge end thereof, so that when each of these sheets is moved forwardly away from the stack by the pneumatic gripper this sheet will deflect the resilient separating fingers out of the path of the sheet and permit these fingers to spring back into the path of the next following sheet for preventing the latter from being carried away with the first sheet and thereby aid in preventing the feeding of more than one sheet from the pile or stack at a time.

These spring separating fingers may be held in place in any suitable manner but preferably by securing the rear ends of the same between an upper cross bar 23 on top of the magazine, and a clamping plate 24 connected with the underside of this bar 23 by means of bolts 25, as shown in Figs. 1, 3 and 4.

In handling some kinds of sheet material it has been found that the same tend to stick together and are liable to be fed off more than one at a time unless the upper corners thereof are held back relative to the lower parts of these sheets. To accomplish this two detent fingers 26 are provided which are arranged in the path of the upper corner portions of the stack so as to be engaged by the front side of the opposite upward corners of the successive sheets and hold the same back relative to the lower corners thereof while the pneumatic gripper seizes the central part of the respective sheet and moves the latter forwardly, thereby causing this sheet to bulge forwardly to a greater extent during the initial part of its forward movement with the gripper and thereby cause the same to be separated effectively from the next following sheet in the stack.

In order to enable these detent fingers to be accurately adjusted to the upper front corners of the sheets to suit different conditions and requirements, each of these fingers is mounted on the front end of a supporting rod 27 and the latter is adjustably secured to the adjacent upright part 131 of the bar 23 by means of a clamping bolt 28 so that the respective finger 26 can be either raised or lowered or moved longitudinally of the magazine to suit the requirements of the particular sheets which are being fed.

In order to permit of adjusting the nozzle 20 for delivering the jet of air against the sheets in the stack to suit different conditions or requirements, this nozzle is mounted on the front end of a longitudinal pipe 29 which is capable of sliding lengthwise in a guideway formed between the upper part of the cross bar 23 and a clip 30 secured to the upper side of this cross bar, and a set screw 31 arranged in the clip 30 and engaging with the longitudinal pipe 29, as shown in Figs. 1, 3 and 4. This air blast nozzle may receive air under pressure from any suitable source, for instance from a rotary blower, compressor or pump 32 mounted on the lower part of the main frame 14 and having its outlet connected with the longitudinal pipe 29 of the blast nozzle by means of a conduit comprising a lower section 33 connected with the outlet of the air pump or blower 32, and a flexible section 34 connecting the upper part of this lower conduit section 33 with a branch pipe 291 extending laterally from the rear end of the longitudinal pipe 29, as best shown in Figs. 1 and 6. Due to

the flexibility of the pipe section 34 the nozzle 20 and associated parts can be adjusted freely to the required position without interfering with the piping between the same and the pump or blower 32.

this block and the gripper rod 38 are held against turning.

The gripper rod, together with the gripper mounted thereon, are moved backwardly by resilient or yielding means which, in the present case, preferably consist of a spring 44 arranged lengthwise of the gripper rod 38 on that side thereof opposite to the guide rod 42, which spring is connected by means of a screw 45 with the corresponding end of the cross block 41, while the rear end of this spring is secured to an arm 46 extending outwardly from the supporting head 40 and in effect forming a part thereof.

Forward movement of the gripper 19 and its rod 38 is effected by means of an upright rock lever 47 pivoted on a bracket 48 projecting rearwardly from the abutment plate 36, the lower arm of this lever engaging with the rear side of the cross block 41, while the upper arm is connected by means of a connecting rod 49 with the crank 50 of a disk 51. The latter is secured to the upper end of a counter shaft 52 which is journaled in a lower bearing 53 in the supporting head 40 and also in an upper bearing formed in a bracket 54 secured to the upper part of the abutment plate 36. A continuous rotary movement is imparted to the shaft 52 from a source of power such as an electric motor 55, for which purpose motion may be transmitted from this motor to the shaft 52 in any suitable or approved manner. As best shown in Fig. 6 this is accomplished by means of a horizontal driving shaft 56 journaled in the lower part of the main frame and driven from the motor 55 by means of a belt 57 passing around pulleys 58, 59 secured to the motor shaft and the main driving shaft respectively, an intermediate shaft 60 journaled in suitable bearings in the bracket 54 and the main frame, intermeshing bevelled gear wheels 61, 62 operatively connecting the driving shaft 56 with the upright shaft 60, and intermeshing gear wheels 63, 64 secured to the upper parts of the intermediate shaft 60 and the countershaft 52.

Motion for driving the pump 32 is also derived from the motor 55 and for this purpose a belt 65 is employed and passes around an upper pulley 66 on the driving shaft 56, and a pulley 67 on the shaft of the air compressor, pump or blower 32.

The front part of the gripper rod 34 is of tubular form as shown at 68 and communicates with the face of the pneumatic gripper or suction cup 19, as best shown in Fig. 5. On one side the tubular part of this gripper rod is provided with a longitudinal slot or port 69 which is adapted to communicate alternately with a suction port 70 in the supporting head 40 and with the atmosphere for the purpose of either creating a vacuum or suction effect in the gripper 19 so as to enable the same to attach itself to the foremost sheet in the stack, or to destroy this vacuum effect and release the hold of the gripper on the respective sheet. For this purpose the slotted port 69 in the side of the front part of the gripper rod is so located and is of such length that while this gripper rod is in its forward position this slot is arranged within the head 40 and communicates with the suction port 70, whereby air is exhausted from the tubular part 68 of the gripper rod and the gripper or cup 19 connected therewith, so that the latter, upon engaging the central part of the foremost sheet in the stack, will cause this sheet to adhere

In order to enable the pressure of the air blast nozzle 20 to be regulated in accordance with the requirements of the particular sheets which are being fed, an adjusting or regulating valve 35 is provided in the conduit leading to this nozzle, which adjusting valve is preferably arranged in the upper part of the conduit section 33 where the same is within convenient reach of the operator while setting up the machine and thus enables him to vary the pressure of the air issuing from the nozzle 20 so as to obtain the required separating effect on the foremost sheets of the stack which are being fed.

This regulating valve 35 is preferably so constructed that the same will permit either the entire air pressure from the pump or blower 32 to pass to the nozzle 20, or it will permit more or less air pressure of this pump to reach the nozzle 20, while some of the air pressure is permitted to escape to the atmosphere and still operate the pump or blower at the same speed or output, thereby avoiding the necessity of varying the speed of the pump to secure such variation in air pressure at the outlet of the nozzle, as would otherwise be necessary.

When the pneumatic gripper 19 of the sheet separating mechanism reaches the forward part of its stroke and the suction of this gripper upon the foremost sheet is released, this sheet is deposited upon the inner side of a stationary abutment which, in the present case, preferably consists of an upright abutment plate 36 which is arranged transversely in front of the outlet end of the magazine but separated therefrom by an intervening space. This abutment plate is secured to the upper end of the main frame 14 and provided with an opening 37 through which the pneumatic gripper 19 is adapted to move during the operation of advancing toward the front end of the stack for receiving the foremost sheet thereof and then retracting in rear of the face or front side of this abutment for depositing the separated sheet against the abutment.

Although various means may be provided for reciprocating the pneumatic gripper and also exhausting the air therefrom to produce a gripping effect and destroying the suction so as to interrupt this suction effect, it is preferable to employ the means for this purpose which are best shown in Figs. 1, 2, 3, 5 and 6 of the drawings and constructed as follows:

The numeral 36 represents a longitudinal rod which carries the suction cup or gripper 19 at its front end and which is guided so as to permit the same to reciprocate lengthwise in a guideway 39 formed in the upper part of a supporting head 40 which is mounted on the rear side of the abutment plate 36. The rear end of this gripper rod 38 projects beyond the rear end of the supporting head 40 and is provided with a transverse block 41. Rotation of the gripper rod 38 is prevented but longitudinal reciprocation thereof is permitted by means of a steadying guide rod 42 arranged on one side of the gripper rod 38 and secured at its front end to the supporting head 40 while the rear part thereof passes through an opening 43 in the adjacent part of the cross block 41 so that the latter can slide on this guide rod 42, but

to this gripper and to be moved forwardly from the stack, but when this gripper or suction cup reaches a position within the opening 37 of the abutment during the last part of the retracting movement of the gripper cup and rod, then the inner end of the slot 69 will have passed outwardly beyond the suction port 70 so as to cut off the further air exhausting effect from the suction cup or gripper and the outer end of this slot will have passed beyond the outer side of the supporting head 40 and thereby place the interior of the tubular part of the gripper rod and the gripper cup in communication with the atmosphere, and cause the vacuum therein to be broken and the grip of the cup 19 on the sheet to be released.

The suction through the port 70 is produced by connecting the same with the inlet of the pump, blower or compressor 32 by means of a pipe or conduit 71, as shown in Fig. 6. In order to enable the operator to cut off the suction effect of this pump from the pneumatic gripper and also to restore the same when desired and still permit the air pump or compressor to operate continuously, a vent or controlling valve is provided for either breaking the vacuum effect of the pump on the pneumatic gripper 19 or restoring the same, which valve in its preferred construction consists of a valve body 72 connected with the conduit 71 so as to form a part thereof, and a shutter 73 pivoted on the valve body 72 and adapted to open and close a port 74 in the side of the latter. When the port 74 is closed the suction of the pump or compressor 32 upon the pneumatic gripper 19 is effective but when the shutter 73 of the vent valve is open, as shown in Fig. 1, the suction effect of this pump upon the pneumatic gripper is broken and thereby stops the feeding action of sheets from the magazine to the abutment. This vent valve therefore enables the sheet feeder to be quickly stopped and started from a point on top of the machine where this vent valve is located and thus facilitates adjusting the parts when getting the machine ready for a run. The air exhaust pipe 71 is also provided with a regulating valve 75 whereby more or less of the air exhausting effect of the blower 32 may be exerted on the pneumatic gripper 19 and more or less of the air which is drawn in by the inlet side of this pump may be derived from the atmosphere and thereby enable the hold of the pneumatic gripper on the sheets which are being fed to be regulated to suit different materials or conditions and still permit the air compressor or pump to operate at the same speed.

After each sheet has been moved lengthwise from the front side of the stack and released at the front side or face of the abutment, this sheet is moved transversely relative to the magazine and separating mechanism and delivered or ejected from the feeding machine for such use as may be desired. The delivering or ejecting mechanism for this purpose, as shown in the drawings, is preferably constructed as follows:

Movable in a direction parallel with the face of the abutment and projecting from the face thereof toward the magazine is an ejector which preferably consists of two fingers 76 which are arranged one above the other. Each of these ejector fingers is arranged at the inner end of a horizontal rod 77 which is movable lengthwise in a horizontal slot 78 in the adjacent part of the abutment 36.

The two outer ends of the two ejector rods 77

are secured by means of bolts 79 or other suitable fastening to the upright arm 80 of a transverse reciprocable slide which is arranged in rear of the abutment 36, which arm is provided with a horizontal rod 81 which is movable in a guideway consisting of two clips or eyes 82 mounted on the rear side of the abutment plate, as best shown in Figs. 1, 2, 5 and 6.

A reciprocating movement is imparted to this ejector slide by motion derived from the electric motor 55 by operatively connecting this ejector slide with the counter shaft 52. The means for actuating the ejector slide from this counter-shaft preferably comprises a crank disk 83 arranged on the lower end of the counter shaft 52 and provided with a crank 84 and a connecting rod 85 which connects the crank 84 with a coupling block 86 on the outer part of the ejector rod 81.

The two slots 78 in the abutment plate 36 are arranged above and below the opening 37 which receives the pneumatic gripper or cup, as best shown in Fig. 4, so that the movements of this gripper lengthwise back and forth between the magazine and the abutment plate and the movement of the ejector fingers transversely back and forth will not interfere with each other.

The relative timing of this sheet separating and ejector mechanism is such that after the ejector fingers have moved forwardly and carried the sheet out of the path of the retracted pneumatic gripper the latter will advance toward the foremost sheet in the stack, grip the same and carry it forwardly to the abutment plate, and during such movement of the newly separated sheet the ejector fingers are retracted from their foremost position to the rearmost position and thereafter effect the next following forward movement during which they engage the rear edge of the sheet which has been deposited in front of the abutment and move the latter transversely away from the pneumatic gripper and toward the opposite side of the same and the magazine.

This movement of the parts continues in the order mentioned while the machine is in normal operation, thereby causing the sheets to be successively separated lengthwise from the magazine and then delivered or ejected transversely from the space between the magazine and the abutment.

As each sheet is discharged from the feeding mechanism any desired disposition of the same may be made, depending on the particular use which is to be made of the sheets or the character of the machine with which this feeding mechanism cooperates.

Inasmuch as it is immaterial what disposition is made of the sheets after they leave the feeding mechanism the drawings in the present case merely illustrate a conventional carrier, conveyor or propeller which is adapted to receive the sheets from the ejector mechanism of the sheet feeder and move the same to whatever mechanism is intended to receive the successive sheets or to operate upon them. The conveyor mechanism for this purpose which is shown conventionally in the drawings comprises two supporting rollers or pulleys 87, 87 journaled by means of upright pivots 88 on the main frame of the machine and two endless belts 89 passing with their receiving turns around the pulleys 87 and adapted to receive between their opposing longitudinal stretches the sheets which are successively fed off from the stack in the magazine

The delivery turns of the conveyor belts may be located wherever desired and form part of the machine which receives the sheets and operates upon them.

5 The conveyor belts may also be driven by various means and as these form a part of the present invention no special form of mechanism is shown or described for this purpose.

10 This sheet feeding machine is very simple and compact in construction and therefore well-suited for use in connection with machines in which a limited amount of space is available for a mechanism of this character. None of the parts of the machine are of delicate construction and on this account the machine is very durable and not likely to get out of order. Moreover, this machine is capable of feeding sheets of various stiffness, texture or quality with comparative rapidity and without any appreciable number of misses, thereby enabling the feeding of sheets from the stack to be effected with reasonable uniformity and accuracy and also insuring a substantial economy due to the avoidance of loss of time which would be incident to frequent stoppage of the machine.

I claim as my invention:

1. A sheet feeding machine comprising a supply magazine adapted to support a stack of sheets, an abutment arranged transversely in front of said magazine, a reciprocating pneumatic gripper movable lengthwise for carrying sheets from the front of said magazine to said abutment, a suction tube carrying said gripper and communicating therewith, means for alternately exhausting air from said tube for causing said gripper to hold a sheet and breaking said exhausting effect to release the sheet from said gripper, positive means for moving said tube forwardly, and resilient means for moving said tube backwardly.

2. A sheet feeding machine comprising a supply magazine adapted to support a stack of

80 sheets, an abutment arranged transversely in front of said magazine, a reciprocating pneumatic gripper movable lengthwise for carrying sheets from the front of said magazine to said abutment, a suction tube carrying said gripper and communicating therewith, means for alternately exhausting air from said tube for causing said gripper to hold a sheet and breaking said exhausting effect to release the sheet from said gripper, a block connected with said tube, positive means for moving said tube forwardly including a rock lever having one arm engaging the rear side of said block, a rotary shaft having a crank, a rod connecting said crank and the other arm of said lever, and a spring for retracting said tube connected at one end with said block and at its opposite end with a stationary part of the machine.

3. A sheet feeding machine comprising a supply magazine adapted to support a stack of sheets, an abutment arranged transversely in front of said magazine, a reciprocating pneumatic gripper movable lengthwise for carrying sheets from the front of said magazine to said abutment, a suction tube carrying said gripper and communicating therewith, means for alternately exhausting air from said tube for causing said gripper to hold a sheet and breaking said exhausting effect to release the sheet from said gripper, a block connected with said tube, positive means for moving said tube forwardly including a rock lever having one arm engaging the rear side of said block, a rotary shaft having a crank, a rod connecting said crank and the other arm of said lever, a support having a guideway in which said tube slides, a guide rod for said block secured to said support on one side of said tube, and a retracting spring connected at its front end with said block on the opposite side of said tube and attached at its rear to a part of said support.

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